INSTRUCTION MANUAL

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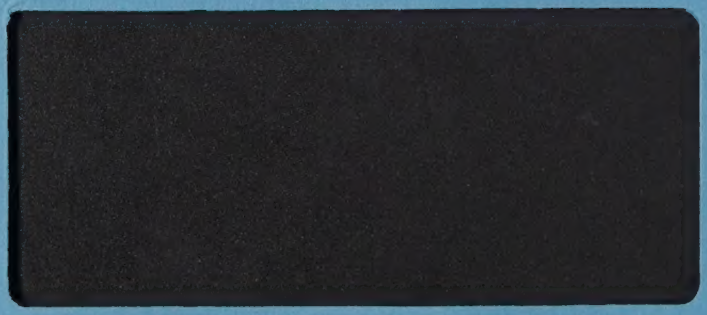

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Service Manual Volume II-B

TEST RECEIVER ESVP

354.3000.32

VOLUME II-B
Manual consists of 3 volumes

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5. Servicing Instructions for Individual Modules

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SERVICE INSTRUCTIONS

Attenuator

342.9215.00

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5. Service Instructions for Attenuator

(See circuit diagram 342.9215 S)

5.1 Circuit Description

The attenuator consists of a base plate with the attenuator pads, the drive system with the switching contacts and a control board.

Ten transmission line sections, eight attenuator pads and an input for the calibration signal are soldered onto the base plate which is made of copper for improved heat dissipation. The transmission lines and attenuator pads are of thin-film design using ceramic for a substrate. The 1- and 4-dB attenuator pads are arranged in a T configuration, whereas a π-arrangement is used for the 10- and 20-dB attenuator pads and a dual π-arrangement for the 40-dB pads. The contacts of the attenuator pads and transmission lines are gold-plated for enhanced switching reliability and life expectancy. The drive system for the contacts contains nine rocker switches that are switched over by means of solenoids and kept in the final position by means of permanent magnets. Each of these rocker switches controls three switching contacts one of which alternately interconnects the transmission lines and the other two switch the appropriate attenuator pad into circuit. High contact force (0.2 N) ensures reliable contacts.

5.2 Checking the Performance Specifications

The RF attenuator is best checked together with the attenuator control board.

5.2.1 Checking the Zero Insertion Loss with a DC Voltage

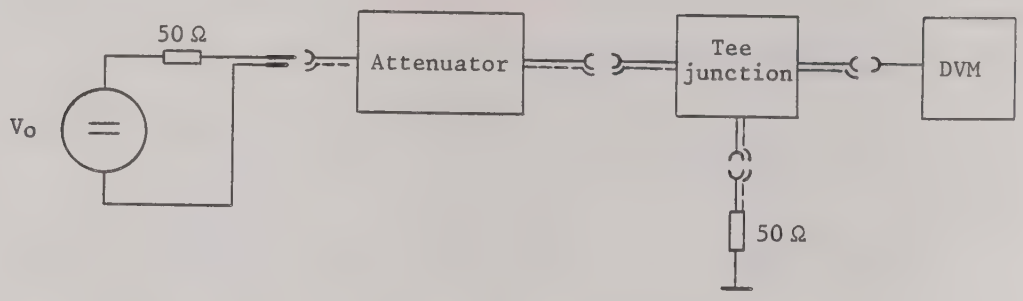
- Set the attenuator to 0 dB.
- Measure the resistance between the inner conductor of the input and inner conductor of the output by means of an ohmmeter with a resolution of 100 mΩ.
- The resistance consists of the contact resistance of the 18 switching contacts and the line resistances of the thin-film conductors. The resistance of the connecting lines is taken account of in the measurement. The resistance R_T should be < 800 mΩ. The resulting zero insertion loss a_0 is given by the formula

$$a_0 = 20 \log \frac{100}{100 + R_T/\Omega}$$

  and is < 0.07 dB.
- Then measure the resistance between the inner conductor of the calibration input and the inner conductor of the output. To this end, set the attenuator to 0 dB with the CAL key depressed (see section 5.1). The resistance should be < 500 mΩ.

5.2.2 Checking the Attenuator Pads with a DC Voltage

Test setup:



- Connect a constant DC voltage source V ≦ 5 V with an internal resistance of 50 Ω to the input of the RF attenuator.
- Measure the output voltage of the through-connected (0 dB) attenuator by means of a digital voltmeter. The attenuator is terminated with 50 Ω.
- Successively cut in the individual attenuator pads, 1, 4, 10, 20 and 40 dB. The attenuator control cannot be used for this purpose; instead, short 12-V switching pulses must be applied directly to the terminals accessible on the control board. The connection to the attenuator control is interrupted.

The attenuation actually provided can be calculated from the voltage ratios:

$$a = 20 \log \frac{V\ (0\ dB)}{V\ (a/dB)}$$

The maximum permissible attenuation error is given in the following table:

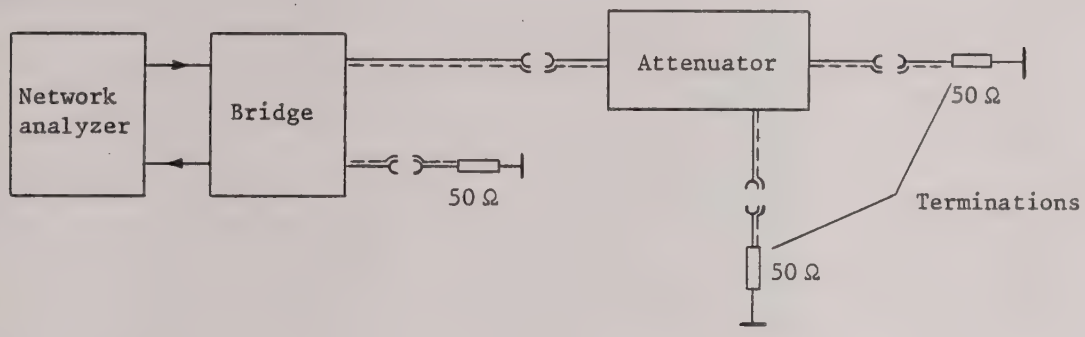
Attenuator pad/dB	a_{min}/dB	a_{max}/dB
1	0.97	1.03
4	3.97	4.03
10 (1)	9.95	10.05
10 (2)	9.95	10.05
20 (1)	19.93	20.07
20 (2)	19.93	20.07
40 (1)	39.9	40.1
40 (2)	39.9	40.1

The location of the individual attenuator pads is shown in the circuit diagram.

5.2.3 Checking the Attenuator Pads at Higher Frequencies

5.2.3.1 VSWR and Switching Reliability

Test setup:



Since considerable frequency-dependent fluctuations may occur the VSWR should be checked in swept-frequency operation up to 1300 MHz using a network analyzer and a bridge.

- With open or closed circuit at the test branch of the bridge set the reflection loss for a = 0 dB reading on the network analyzer.
- Connect attenuator. Measure the VSWR at all RF terminals of the attenuator. The free sockets are terminated with 50 Ω.

  The following equations apply:

  For the reflection coefficient: $r = 10^{-\frac{a_r}{20}}$

  For the VSWR: $VSWR = \frac{1 + r}{1 - r}$

The measured VSWR over the entire frequency should be $\leqq 1.2$ ($a_r \leqq 16.9$ dB) for all attenuation values.

- Switching reliability and repeatability of the contacts can be checked by switching back and forth several times between two attenuation values or one attenuation value and the transmission line. Changes in the reflection coefficient indicate irregularities.

5.2.3.2 Attenuation

For checking the attenuator at higher frequencies, in particular at frequencies above 1000 MHz a special attenuation test is required. It is, therefore, recommended that the nearest R&S agent be contacted if the error of one or several attenuator pads apparently exceeds the permissible tolerance. The maximum attenuation error Δa_{max} = ±0.2 +1.3% of the attenuator setting (maximum 1 dB). The typical attenuation error Δa = ±0.1 dB ±0.6% of the attenuation value (maximum 0.5 dB).

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
•	ZUGEHOERIGER STROMLAUF 342.9215 S		
BU1	BUCHSE SOCKET	294.8154	294.8077
BU2	BUCHSE SOCKET	294.8154	294.8077
BU3	BUCHSE SOCKET	294.8154	294.8077
BU10	FR JC-FASSUNG 16 POLIG 16-PIN IC-SOCKET PRECICONT US016T	FR 249.6091	294.8548
R1	BD DAEMPFUNGSGLIED 4DB/50 ATTENUATOR 4DB/50	912.5230	294.8077
R2	BD DAEMPFUNGSGLIED40DB/50 ATTENUATOR 40DB/50	912.5269	294.8077
R3	BD DAEMPFUNGSGLIED10DB/50 ATTENUATOR 10DB/50	912.5246	294.8077
R4	BD DAEMPFUNGSGLIED20DB/50 ATTENUATOR 20DB/50	912.5252	294.8077
R5	BD DAEMPFUNGSGLIED40DB/50 ATTENUATOR 40DB/50	912.5269	294.8077
R6	BD DAEMPFUNGSGLIED 1DB/50 ATTENUATOR 1DB/50	912.5217	294.8077
R7	BD DAEMPFUNGSGLIED20DB/50 ATTENUATOR 20DB/50	912.5252	294.8077
R8	BD DAEMPFUNGSGLIED10DB/50 ATTENUATOR 10DB/50	912.5246	294.8077
RS1	ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8090
RS2	ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8090
RS3	ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8090
RS4	ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8090
RS5	ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8090
RS6	ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8090
RS7	ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8090
RS8	ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8090
RS9	ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8090
ST1	FP WINKELSTECKERLEIST.36P CONNECTOR PERG 75168-113-36	FP 243.3578	294.8548
			- ENDE -

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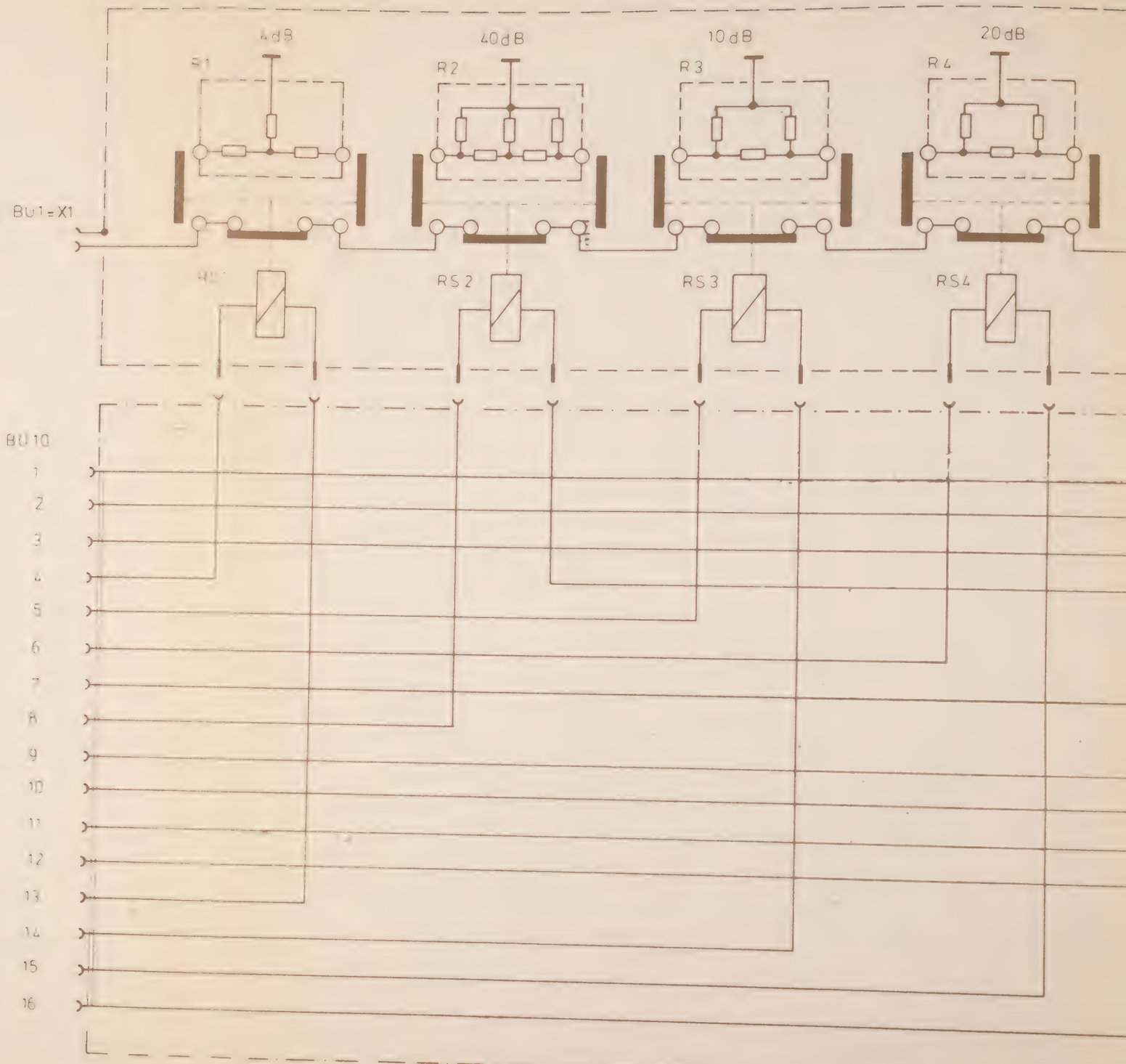
Dampfungsglieder eingeschaltet
mit neg Spannung an den
Eingangen 1 - 9

Attenuator pads switched on
if a neg voltage is applied
to inputs 1 - 9



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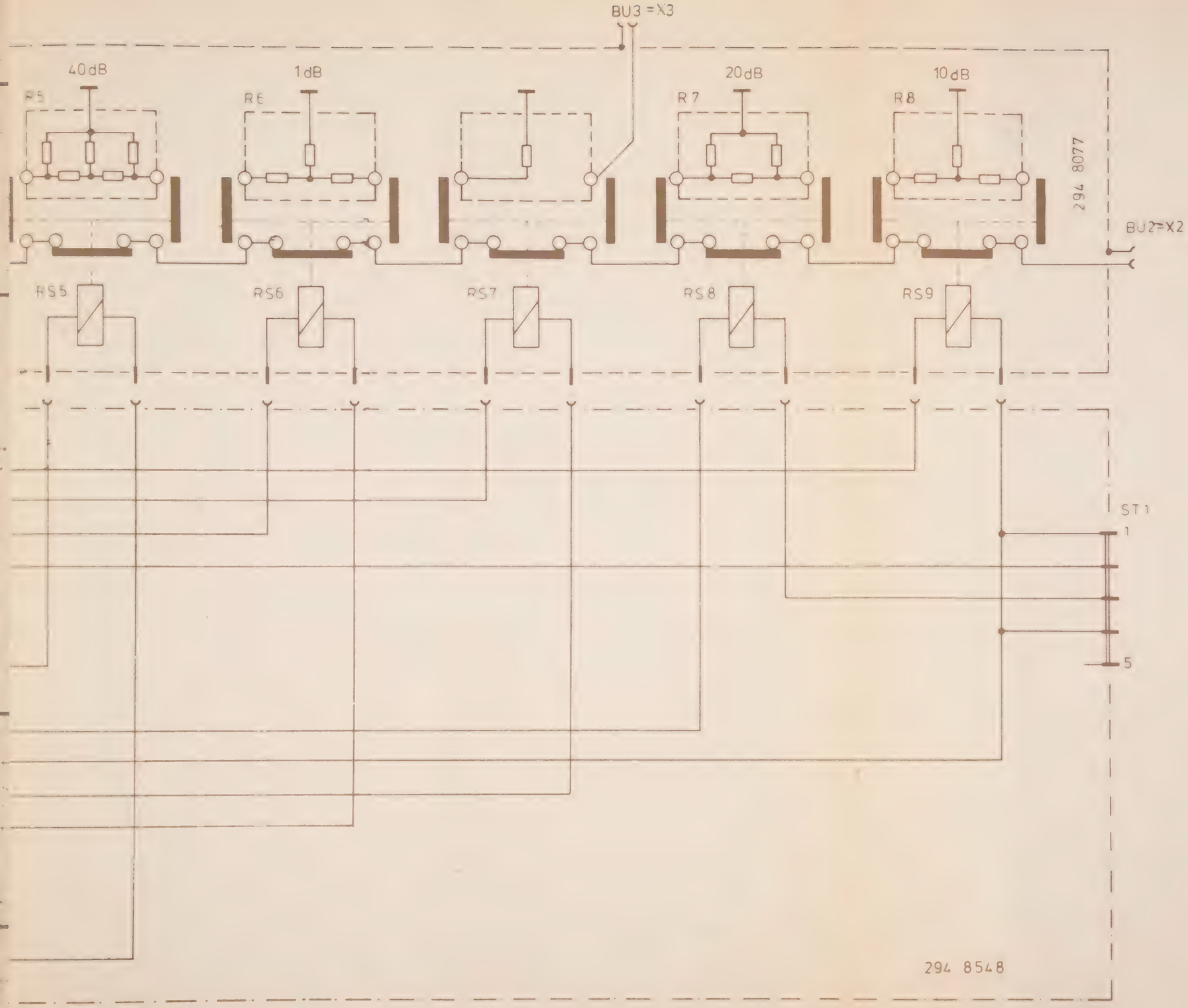

Stromlauf zu Baugruppe Eichleitung für Attenuator for ESV

Z

Zeichn. Nr. 342.9215 S 1

reg. LV 342.4020V

orafo Z 342.4020

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ROHDE&SCHWARZ

SERVICING INSTRUCTIONS

Calibration Generator

354.6016.02

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Circuit Components List
Circuit Diagram
Circuit Layout Plan

5 Servicing Instructions for Calibration Generator

(See Circuit Diagram 354.6016 S and Level Plan.)

5.1 Circuit Description

The calibration generator has two main functions:

a) For the level calibration and in TWO PORT operation it generates an output signal of -17 dBm at the receiver midband frequency from the inputs of the 10.7-MHz IF midband frequency and the outputs f_{01} and f_{02} of the frequency-mixer oscillators (tracking generator).

b) In REM. FREQ. operation it generates from the inputs of the FM-IF signal and frequency-mixer oscillator outputs a signal of -17 dBm (= 90 dBµV) into 50 Ω phase-locked to the receiver frequency.

The IF signal is brought in on terminal X132 at a level of -12 dBm, attenuated, amplified in stage V1, V2 and , after low-pass-filtering and attenuation, applied to mixer U1.

The 2nd-oscillator signal of 300 or 800 MHz is brought in on terminal X133, highpass-filtered, amplified in broadband amplifier N1, and also applied to mixer U1.

The output product (310.7 or 810.7 MHz) is amplified in broadband amplifier N2 and applied as reference signal to mixer U2, which functions as a phase comparator.

5.1.1 PLL Oscillators

Which of the two oscillators is switched in is controlled by the logic signal on pin X131.20b:

X131.20b: <520 MHz = high = (f_{osc} = 810.7 MHz)
low = (f_{osc} = 310.7 MHz)

The two comparators N9/II and N9/III control transistors V30 and V40, which switch the supply voltage to the 310.7-MHz and 810.7-MHz oscillator respectively.

Both oscillators operate in the grounded-drain configuration with a Clapp circuit.

The 310.7-MHz oscillator signal is coupled out through L57 and after being filtered in a five-element lowpass filter is applied through a T-section to broadband amplifier N5.

The 810.7-MHz signal is similarly processed and applied to N5, which is supplied with +12 V via L76.

After amplification in N5, the signal branches through a resistor network with R79 as the first resistance to mixer U3 and, after amplification in broadband amplifier N6, to phase comparator U2.

5.1.2 PLL Amplifier and Capture Circuit

During the unlocked state of the PLL oscillator, phase comparator U2 outputs on its IF output, pin 2, the beat-frequency signal with a value of about 200 mV peak-to-peak. The output is loaded via C36 with R37.

When the oscillator is in lock, the output from U2.2 is a phase-dependent DC voltage in the range ±100 mV.

Capture Circuit and Lock Detection:

The reference signal input of PLL amplifier N3 is grounded through resistor R158.

When the oscillator is in lock, the output from U2.2 is about +40 mV DC and compensates the negative offset voltage applied via R151 to N3.2.

In the nonlocked state of the oscillator, this negative voltage results in comparator N4/I loading C153 with a negative charge. This in turn results in a sawtooth search voltage on output N3.6 with a frequency of about 1 kHz.

During search, C155 is discharged via diode V155, and N4/IV, via V153, switches on transistor V151 which, as "open collector" indicates the unlocked condition with a low signal on X131.20a. At the same time (during search), the LED H1 is lit via driver N4/III.

5.1.3 Input from 1st Oscillator

The 1st-oscillator signal is brought in on terminal X134 at a level of about -15 dBm. The frequency ranges of this signal are shown in Table 5-1.

The double series of pi-section attenuators and broadband amplifiers N14 and N15 provide a high backward attenuation.

The signal on mixer U3 is thus an LO signal of about +6 dBm. This is mixed with the PLL-oscillator signal on input U3.1 to produce on output U3.2 the signal at the receive frequency at a level of about -18 dBm.

5.1.4 Filter Range

The output signal of U3 must be filtered to eliminate the spurious components. In particular, the very strong component of the 1st-oscillator signal must be suppressed.

The filter ranges are shown in Table 5-1. The ranges are so fixed that their lowpass limit frequencies assure adequate suppression of the 1st-oscillator signal, since the frequency of this signal lies above the input frequency in ranges 5 to 9. Since above 520 MHz the 1st IF of 310.7 MHz (=PLL-oscillator frequency) lies below the corresponding lowpass limit frequency, the 310.7-MHz signal is suppressed by a frequency trap at the output of channels 6, 7, 8, and 9. The range 1020 to 1300 MHz, in which the frequency of the 1st-oscillator signal lies below the input frequency, is implemented with a tracking bandpass filter with a synchronous frequency trap for the 1st-oscillator.

The switching-in of the correct frequency range is accomplished with PIN-diode switches in T configuration driven by N9 to N12. The functioning of filter-channel 5 will be explained by way of example:

Opamp inputs N9IV and N12I lie at a reference voltage of about 1.4 V. If the control input on X131.20b is low, the N9/IV output, on pin 14, is at about -9 V. The transverse diode V222 is thus forward-biased through resistor R201 and is conducting, whereas diodes V221 and V223 are reverse-biased and non-conducting. The output side of the filter channel has a symmetrical arrangement and transverse diode V272 is conducting. If the control input on X131.20b goes high (to +5 V), N9/IV and N12/I are switched to about +11 V. R201 is bridged by V201, and R235 and R211 split the current via the conducting diodes V221 and V223 with V222 non-conducting. The output side of the filter functions similarly.

The transmitted signal is applied to broadband amplifier N22.

5.1.5 End Stage and Level Control

A PIN-diode controller in a pi-configuration following N22 permits level control over the entire frequency range of 20 to 1300 MHz.

In the following module, the level is amplified by 36 dB to bring it to +6 dBm. The signal level is sensed at this point by a high-impedance diode rectifier circuit and the signal, after 23 dB of attenuation, is applied to output terminal X135 at a level of -17 dBm (90 dBµV) into 50 Ω.

The rectified voltage goes to a chopper amplifier N8, which functions as a voltage follower. The following chopper amplifier N9 amplifies the DC voltage to +5 V. AGC amplifier N20 is provided with the +5-V reference via voltage divider R188, R189. The following shaping network linearizes the characteristic of the PIN controller.

At pin X131.15b the external control voltage can be measured on the board; in case of control missing, the lock indication X131.20a is operated via N4/II.

The reference voltage with an initial value of +5 V can be corrected via pin X131.10a so that the output level on X135 changes an amount 0.01 dB/40 mV. The correction voltage is provided by a D/A converter (256 steps corresponding to 10 V).

The supply voltages +12-V and +20-V are switched in for the calibration procedure via transistors V160, V163, and V165.

Table 5-1

Filter channel	Frequency range (MHz)	IF (MHz)	Oscillator frequency (MHz)
1 to 5	LP 20 to 520	810.7	830.7 to 1330.7
6	LPT 520 to 690	310.7	830.7 to 1000.7
7	LPT 690 to 820	310.7	1000.7 to 1130.7
8	LPT 820 to 930	310.7	1130.7 to 1240.7
9	LPT 930 to 1020	310.7	1240.7 to 1330.7
10	BP 1020 to 1300	310.7	*709.3 to 989.3

LP = lowpass filter
LPT = lowpass filter with 310.7-MHz trap
BP = bandpass filter, tracking

* = oscillator frequency $<f_{in}$

5.2 Checks and Adjustments

The adjustments on the generator calibration board can be made with use of a test adapter or the board can be connected to the basic instrument by means of an extender board, in which case the instrument provides the control signals (5-V TTL or CMOS voltages).

5.2.1 Supply Voltages

Connector X131	Voltage	Current
.ab1	Ground	-
.ab3	+12 V ±5%	150 mA ±20%
.a4	+10 V ±0.1%	40 mA ±20%
.b4	-10 V ±1%	-55 mA ±30%
.ab5	+20 V ±2%	260 mA ±20% *

* The 20-V supply is switched in by setting X131.6a = high (+5 V).

Additional signal sources required:

X131.a8	2 to 28 V, frequency-dependent (tuning voltage)	
X131.a10	0 to 10 V, 5.00 V nominal level correction	
X132	10.7 MHz	-12 dBm ±2 dB
X133	300, 800 MHz	-12 dBm ±2 dB
X134	709.3 to 1330.7 MHz	-15 dBm +3, -2 dB

5.2.2 Adjustment of PLL-oscillators

→ Check of switched supply voltage

Control input X131.b20 = <520 MHz	Test point P10	Test point P11
high = +5 V	Ø V	appr. 11.5 V
low = Ø V	appr. 11.5 V	Ø V

→ Connect a spectrum analyzer to test point X1.

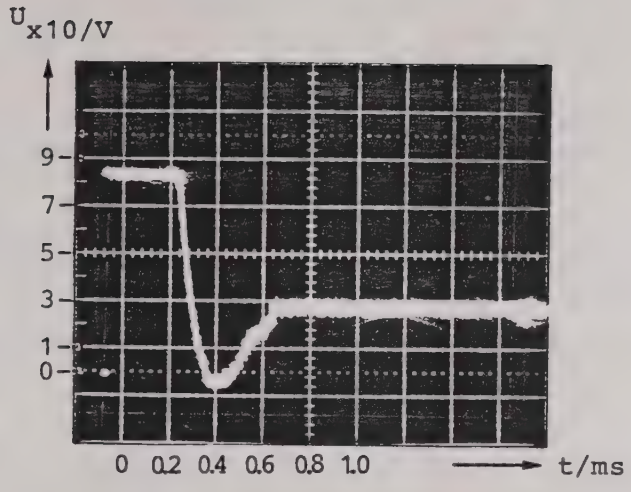
→ Set X131.b20 to high (+5 V = <520 MHz).

→ Apply +2.6 V ±0.2 V DC to X10.2

- With L68 adjust to 810.7 MHz ±1 MHz.
  (Effect of lid must be taken into account.)
- Apply logic low to X131.b20 (Ø V = <$\overline{520\ MHz}$).
- With L58 adjust to 310.7 MHz ±1 MHz.
- By adjusting the coupling separation of L57, adjust level to -37 dBm.
- Apply logic high to X131.b20 (+5 V = <520 MHz).
- With L68 adjust to 810.7 MHz ±1 MHz.
- With trimmer C66 adjust level to -37 dBm.

5.2.3 Check of PLL

- LED H1 must light when the PLL is not in lock.
- At test point X10.1 a sawtooth search voltage of approx. -0.5 V to +9 V with a repetition frequeny of about 1 kHz must be present (measure with an oscilloscope).
- Connect link on X10 and connect voltmeter.
- Apply logic high to X131.20b (+5 V = <520 MHz).
- Apply 10.7-MHz -12-dBm signal to X132.
- Apply 800-MHz -12-dBm signal to X133.
- The VCO must lock on 810.7 MHz, LED H1 must go out. The VCO-control voltage must be 2.6 V ±0.4 V at +25°C.
  (Take effect of lid into account!)
- Vary the signal level at X132 and X133 ±2 dB. LED H1 must not light.
- Apply logic low to X131.b20 (0 V = <$\overline{520\ MHz}$).
- Apply 300-MHz -12-dBm signal on X133.
- The VCO must lock on 310.7 MHz, LED H1 must go out.
- The VCO-control voltage msut be 2.6 V ±0.4 V at 25°C.
  (Take effect of lid into account!)
- Dynamic response of PLL circuit: With an oscilloscope triggered via X131.6a measure the PLL diode voltage at X10.1. The capture time must be less than 1 ms (Fig. 5-1).



Worst case:
t ≤1 ms

Fig. 5-1 Dynamic response of PLL circuit

5.2.4 Check of 1st-oscillator Signal Path

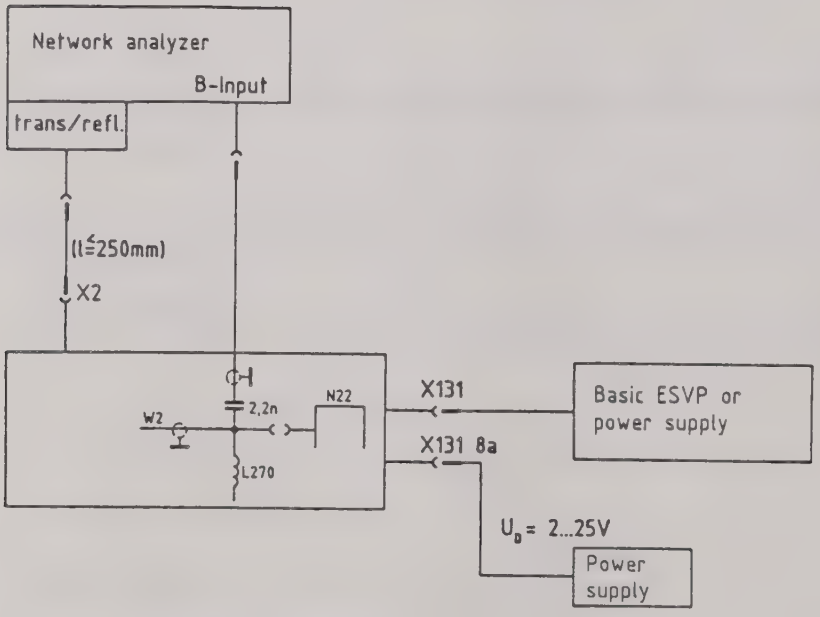
- Connect spectrum analyzer to test point X3.
- With a signal generator apply signals between 709.3 and 1330.7 MHz and -15-dBm level to terminal X134.
- The signal level on X3 must be -20 dBm +8, -3 dB over the frequency range 709.3 to 1330.7 MHz.

5.2.5 Adjustment and Check of Filter Channels

Set up:

- Unsolder C230 and R237. Short-circuit R236 with shortest possible jumper.
- Unsolder W2 and L270 from N22.E.
- Solder the inner conductor of a test cable via a 2.2-nF chip capacitor to the junction point of W2 and L270 and ground the outer conductor of cable to ground.
- Connect the rest of the ESVP to the calibration generator board via an adapter plate or feed in the required voltages via X131 from a power supply.
- Apply the diode voltages of 2 to 20 V separately via X131.8a.

Test setup:



Circuit-under-test : X2-W2 L270

5.2.6 Adjustment of Filters

- To switch to a given filter channel, set the ESVP on the front panel to a corresponding frequency.

- If the board is being supplied with a separate power supply, apply +5 V to the terminal of the corresponding filter channel as shown in the following table:

Frequency range	Terminal	Voltage
20 to 519.9 MHz	X131.20b	+5 V
520 to 689.9 MHz	" .21a,b	+5 V
690 to 819.9 MHz	" .22a,b	+5 V
820 to 929.9 MHz	" .23a,b	+5 V
930 to 1019 MHz	" .24a,b	+5 V
1020 to 1300 MHz	" .25a,b	+5 V

The lowpass filters are trimmed by bending the inductance coils to obtain the characteristics shown in Fig. 5-2.

Within the frequency interval f_l to f_u an optimal adjustment of the insertion and reflection losses should be aimed at.

Within the passband, the pole frequencies with a 20% frequency deviation will be of use in the adjustment for the rapid optimizing of the filter characteristics.

Table 5-2

Lowpass (LP), MHz	Frequency, MHz		Attenuation, dB			Pole frequency, MHz		
	f_l	f_u	a_b	a_r	a_s / f_{MHz}	f_1	f_2	f_3
LP<520 20-520	20	520	<5.5	>10	>35/830.7	250	450	500
LP 6 520-690	520	690	<6.0	>12	>35/830.7	500	600	680
LP 7 690-820	690	820	<6.5	>14	>40/1000.7	705	765	820
LP 8 820-930	820	930	<6.5	>12	>40/1130.7	830	860	925
LP 9 930-1020	930	1020	<7.0	>12	>40/1240.7	910	975	1015

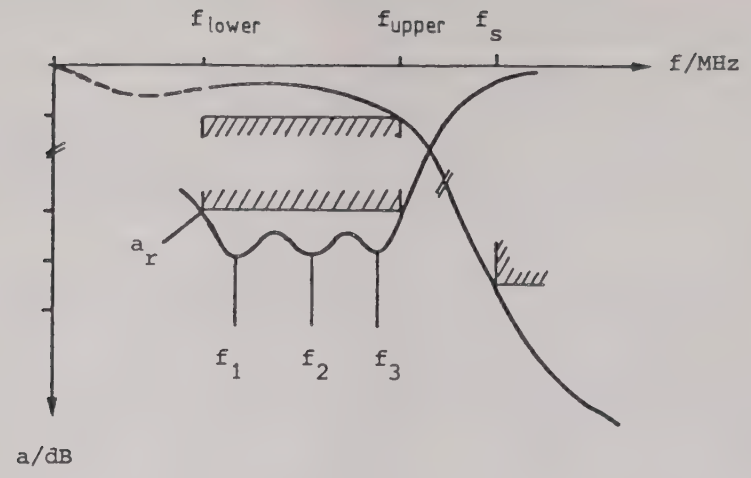


Fig. 5-2 Insertion, return loss and blocking attenuation of LP filters, measured between points X2 and W2 L270.

→ The 310.7-MHz filters of the LP filters are adjusted by bending the following inductance coils:

a_s >35 MHz / 310.7 MHz

for	Filter	Coil
	LP 6 (520-690)	L312
	LP 7 (690-820)	L322
	LP 8 (820-930)	L332
	LP 9 (930-1020)	L343

→ Note: The LP filters alone should have the following attenuations:

a_b <1.2 dB
a_r >14 dB
a_s >35/40 dB

5.2.6.1 Adjustments of Tunable Filter A10

→ Circuit-under-test: X2 to W2-L270.

→ Unscrew the lower cover of the calibration generator.

→ The diode voltages required for the tuning are given in Table 5-3.

→ The tuning of filter A10 must be critical or slightly over-critical in the passband in accordance with the following instructions.

- At f_l = 1020 MHz with C353, C363
  At f_u = 1300 MHz with C352, C362
  (for 6-dB BW ≤160 MHz, a_b <9 dB, a_r >14 dB).
- In the entire frequency range with C371, C354, C364.
- At f_u = 1300 MHz with C355, C365.

Table 5-3

V_D,V	a_b <9.0 dB and a_r > 12 dB at f/MHz	a_{S1} >50 dB at f_{OSC}/MHz	a_{S2} >38 dB at 2xf_{OSC}/MHz
2.00	1020	709.3	1418.6
3.26	1050	739.3	1478.6
4.55	1075	764.3	1528.6
6.00	1100	784.3	1578.6
7.47	1125	814.3	1628.6
8.92	1150	839.3	1678.6
10.34	1175	864.3	1728.6
11.80	1200	889.3	1778.6
13.37	1225	914.3	1828.6
15.07	1250	939.3	1878.6
17.20	1275	964.3	1928.6
20.15	1300	989.3	1978.6

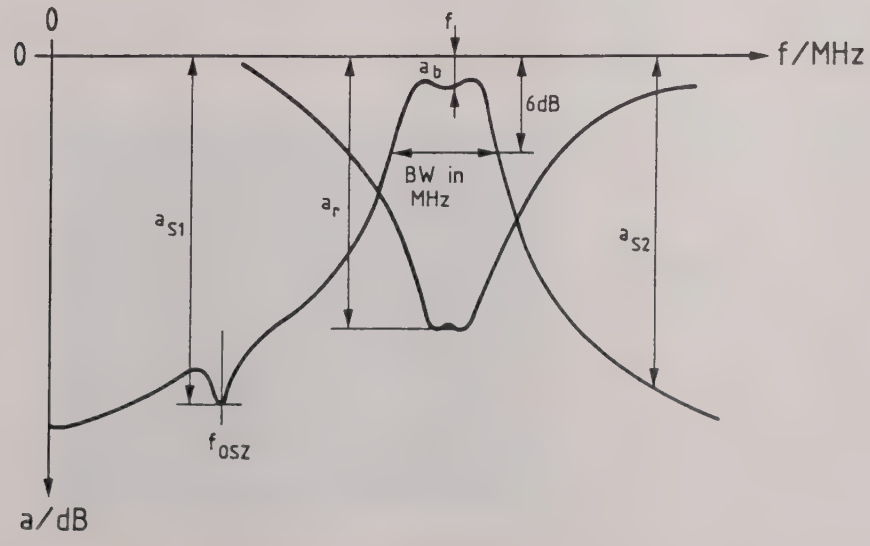


Fig. 5-3 Insertion and return loss and blocking attenuation of tunable filter A10.

5.2.6.2 Adjustment of Tracking Oscillator Trap

→ At $f_{l,\ osc}$ = 709.3 MHz with C351,
at $f_{u,\ osc}$ = 989.3 MHz with L354.

→ In the frequency range 709.3 to 989.3 MHz attenuation a_{s1} must reach a value >50 dB.

→ Check that the attenuation a_{s2} >38 dB at twice the oscillator frequencies.

→ Note: Filter A10 taken alone should have the following attenuations:

a_b <3.5 dB
a_r >16 dB (1020 to 1300 MHz).

5.2.7 Adjustment of Control Voltage

The PIN-diode controller between the N22 and N25 has the function of eliminating the variation of level with the frequency. For this, with each frequency the corresponding filter channel must be switched in. In addition, in case of filter channel 10, the correct tuning voltage, given in Table 5-3, must be applied.

→ Apply a high (+5 V) to the SINCAL terminal X131.6a.

→ Open the connection between N22.A and L275.

→ To X6 connect a signal generator (range 20 to 1300 MHz, +5 dBm ±5 dB) and set the output to 100 MHz, +5 dBm.

→ Switch in filter channel 1 (X131.20b).

→ Connect a thermal power meter to X135 and with R193 adjust the level to -17 dBm ±0.05 dB.

→ Vary the signal level of the signal generator by ±5 dB. The level at X135 must not change by more than 0.05 dB.

5.2.7.1 Check of Level Correction

→ Apply 100-MHz +5 dBm signal to X6.

→ Apply 2.00 V DC to X131.10a.

→ Level at X135 must sink by 0.75 dB ±8% (-17.75 dBm).

→ Apply 8.00 V DC to X131.10a.

→ Level at X135 should rise by 0.75 dB ±8% (-16.25 dBm).

→ For the subsequent tests either 5.00 V or no voltage must be present on X131.10a.

5.2.8 Check of Entire Frequency Range

- Resolder C230 into place between U3.2 and W1.
- Apply signals of the required frequency and level (for example, from the basic ESVP) to X132, X133, and X134.
- At X135 check the level with a power meter and the spectrum with a spectrum analyzer.
- With R193 adjust the output level at X135 for a 100-MHz signal to -17 dBm.

In the entire frequency range:

- Voltage on X10.1: 2.6 V ±0.4 V (at 25°C)
  voltage at X131.15b: 2.9 V ±0.6 V (at 25°C).
- Check the frequency spectrum at X135. Nonharmonics must be more than 26 dB below signal level.

Dynamic response of level control:

- Measure the change in the control voltage on X131.15b with an oscilloscope triggered via X131.6a. The regulation time t must be 10 ms ≤ t ≤250 ms (Fig. 5-4).

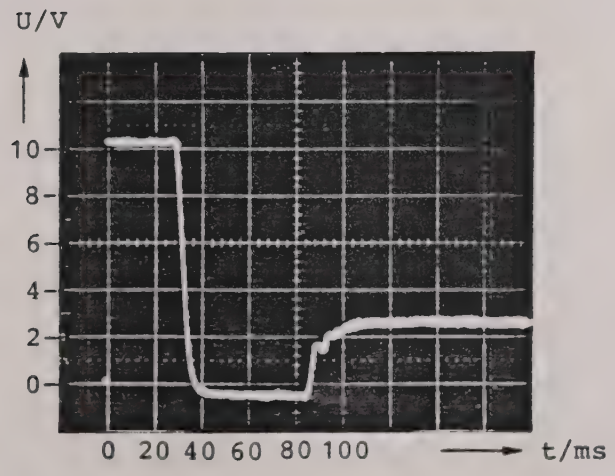


Fig. 5-4 Dynamic response of level control, measured on X131.15b

5.3 Troubleshooting

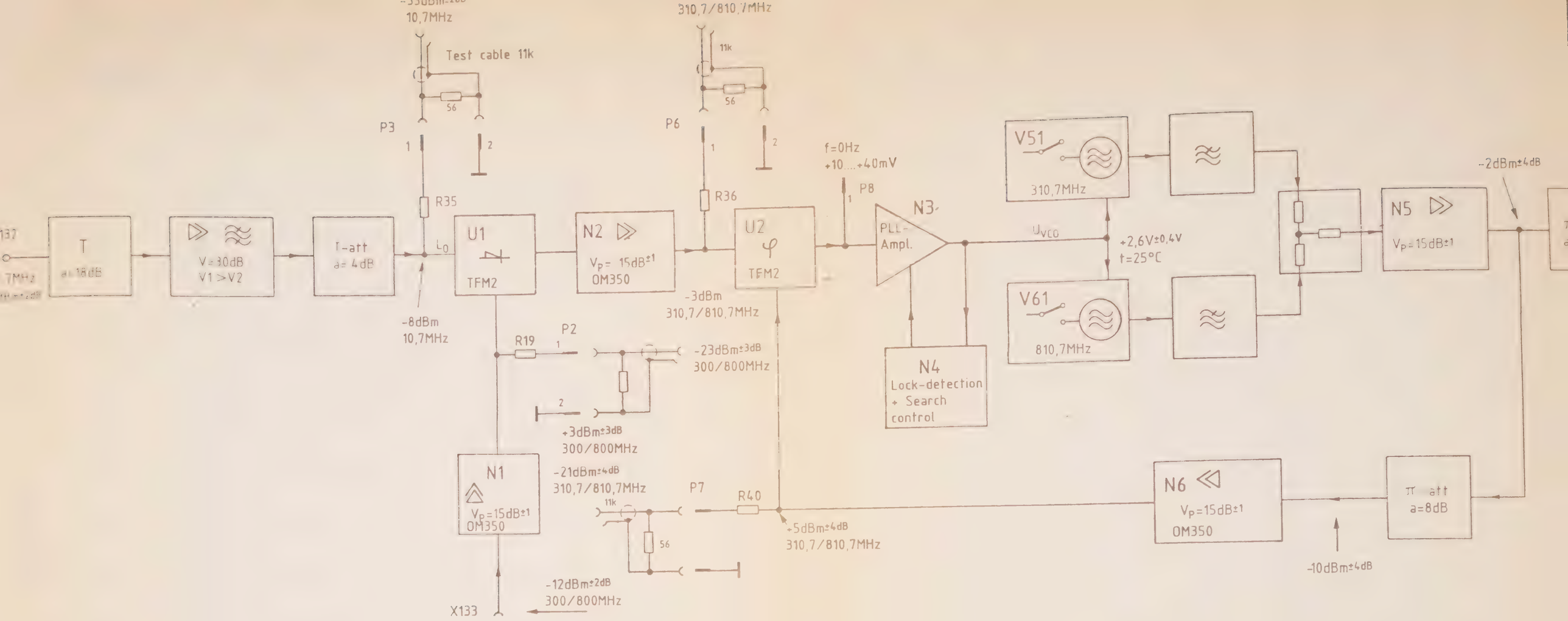
Signal and associated paths can be checked against the Level Plan with a network analyzer. Test links are built in at the most important test points. By the use of the link, the network analyzer or spectrum analyzer can be connected.

5.3.1 Notes

- The capture range of the 310.7-MHz and 810.7-MHz PLL oscillators is about 10 MHz for a control voltage between +1 and +10 V.

- The level correction input X131.10a provides +5.00 V and permits the output level to be adjusted externally 0.01-dB/40-mV. This input can be left open.

- The areas around N25 pin-5 and N18 pin-3 are lacquered for protection against moisture (because of high-impedance leakage current). If the lacquer coating is damaged it must be renewed!


10,7MHz
Test cable 11k
56
P3
1
2
R35
T
a=18dB
V=30dB
V1>V2
T-att
a=4dB
-8dBm
10,7MHz
U1
TFM2
N2
Vp=15dB±1
OM350
310,7/810,7MHz
11k
56
P6
R36
U2
TFM2
-3dBm
310,7/810,7MHz
f=0Hz
+10....+40mV
P8
N3
PLL-
Ampl.
N4
Lock-detection
+ Search
control
V51
310,7MHz
V61
810,7MHz
UVCO
+2,6V±0,4V
t=25°C
N5
Vp=15dB±1
-2dBm±4dB
R19
P2
-23dBm±3dB
300/800MHz
+3dBm±3dB
300/800MHz
N1
Vp=15dB±1
OM350
-21dBm±4dB
310,7/810,7MHz
P7
R40
+5dBm±4dB
310,7/810,7MHz
N6
Vp=15dB±1
OM350
π-att
a=8dB
-10dBm±4dB
-12dBm±2dB
300/800MHz
X133

-17dBm
310,7/810,7MHz

45...8m±5
20 ... 1300MHz

Out - range
a_b=6dB±3dB

X1

X2

-18dBm±5dB

-att
h=6dB

U3
TFM2

-10dBm±3dB
310,7/810,7MHz

+6dBm

X3

-20dBm±8/-3dB
709,3
1330,7MHz

N15
V_p=18dB±2,5

π -att
a=7,5dB

N14
V_p=14dB±2,5

π - att
a=5dB

-15dB+3, -2dB
709,3....1330,7MHz

X134
1.0sz.

FB 10: 1020-1300MHz, a_{max} 709-989MHz

FB 9*: 930-1020MHz, a_{max} 1240-1330MHz

TP

FB 8*: 820-930MHz, a_{max} 1130-1240MHz

FB 7*: 690-820MHz, a_{max} 1000-1130MHz

FB 6*: 520-690MHz, a_{max} 830-1000MHz

520MHz: 20-520MHz, a_{max} 830-1330MHz

* 310.7-MHz wave trap

-30dBm±5dB
20 ... 1300MHz
a_{NW} > 26dB

X6

N22
V_p=20dB
±2,5dB

a=5...50dB
PIN diode
regulator

-4dBm±5dB
20...1300MHz

+2,9V±0,6V / +75°C

X11

-30dB

N25

V_p=20dB
±2,5dB

V_p=16,5dB
+1dB
-0,8dB

+6dBm

a=23dB
T

X135

17dBm
20 ... 1300MHz
a_{NW} > 26dB

N20

N19

N18

10Vref

R188

+5V

R.189

R187

R193

Output level

X131 10a

Level correction
5,00V±40mV / 10^{-10} dB

level plan

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
•	ZUGEH.STROML./CIRC.DIAGR. 353.6016 S		
A1	FILTER MODUL TP 520MHZ	354.6068	
A2	FILTER MODUL TP 6	354.6074	
A3	FILTER MODUL TP 7	354.6080	
A4	FILTER MODUL TP 8	354.6097	
A5	FILTER MODUL TP 9	354.6100	
A10	LEITUNGSKREIS	397.0378	
C1	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C2	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C5	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C6	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C8	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C9	CC 220PF+-2%6X7N750 CAPACITOR VALVO 2222 678 58221	CC 087.6941	
C10	CC 470PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 471	CC 087.6993	
C11	CC 220PF+-2%6X7N750 CAPACITOR VALVO 2222 678 58221	CC 087.6941	
C15	CC 15PF+-2%3X4N750 CAPACITOR VALVO 2222 678 58159	CC 087.6806	
C16	CC 15PF+-2%3X4N750 CAPACITOR VALVO 2222 678 58159	CC 087.6806	
C18	CC 15PF+-2%3X4N750 CAPACITOR VALVO 2222 678 58159	CC 087.6806	
C19	CC 680PF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 681	CC 087.7019	
C31	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C33	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C34	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C36	CC 10NF-20+50%7X8R6000	CC 087.7525	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	CAPACITOR		
	VALVO 2222 63051 64051103		
C41	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C48	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C50	CC 3,9PF/0,25PF63V3X5N750	CC 099.5568	
	CAPACITOR		
	VALVO 2222 678 57398		
C51	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C52	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C53	CC 330PF+-2%6X9N750	CC 087.6964	
	CERAMIC CAPACITOR		
	VALVO 2222 678 58331		
C54	CC 22PF+-2%4X5NP0	CC 087.6464	
	CAPACITOR		
	VALVO 2222 678 10229		
C55	CC 4,7PF+-0,25PF4X5P1C0	CC 087.6258	
	CAPACITOR		
	VALVO 2222 678 03478		
C56	CC 33PF+-2%4X5NP0	CC 087.6487	
	CAPACITOR		
	VALVO 2222 678 10339		
C57	CC 2,7PF+-0,25PF3X4NP0	CC 087.6358	
	CERAMIC CAPACITOR		
	VALVO 2222 678 09278		
C58	CC 6,8PF+-0,25PF3X4N750	CC 087.6764	
	CAPACITOR		
	VALVO 2222 678 57688		
C59	CC 22PF+-2%4X5NP0	CC 087.6464	
	CAPACITOR		
	VALVO 2222 678 10229		
C60	CC 1,8PF+-0,25PF63V3X5NP0	CC 099.5539	
	CAPACITOR		
	VALVO 2222 678 09188		
C61	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C62	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C63	CC 330PF+-2%6X9N750	CC 087.6964	
	CERAMIC CAPACITOR		
	VALVO 2222 678 58331		
C64	CC 4,7PF+-0,25PF3X4NP0	CC 087.6387	
	CAPACITOR		
	VALVO 2222 678 09478		
C66	CC 8,2PF+-0,25PF3X4NP0	CC 087.6412	
	CAPACITOR		
	VALVO 2222 678 09828		
C67	CC 3,9PF/0,25PF63V3X5N750	CC 099.5568	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	CAPACITOR		
	VALVO 2222 678 57398		
C68	CC 2,7PF+-0,25PF3X4NPO	CC 087.6358	
	CERAMIC CAPACITOR		
	VALVO 2222 678 09278		
C69	CC 4,7PF+-0,25PF3X4NPO	CC 087.6387	
	CAPACITOR		
	VALVO 2222 678 09478		
C71	CC 100PF+-2%4X5N750	CC 087.6906	
	CAPACITOR		
	VALVO 2222 678 58101		
C72	CC 3,9PF/0,25PF63V3X5N750	CC 099.5568	
	CAPACITOR		
	VALVO 2222 678 57398		
C74	CC 330PF+-10%3X4R2000	CC 087.6970	
	CAPACITOR		
	VALVO 2222 63051 331		
C76	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C77	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C78	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C80	CC 330PF+-10%3X4R2000	CC 087.6970	
	CAPACITOR		
	VALVO 2222 63051 331		
C82	CC 330PF+-10%3X4R2000	CC 087.6970	
	CAPACITOR		
	VALVO 2222 63051 331		
C84	CC 330PF+-10%3X4R2000	CC 087.6970	
	CAPACITOR		
	VALVO 2222 63051 331		
C85	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C91	CC 2,7PF+-0,25PF3X4NPO	CC 087.6358	
	CERAMIC CAPACITOR		
	VALVO 2222 678 09278		
C101	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
BIS/TO			
C114			
C115	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C116	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C117	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C118	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	VALVO 2222 63051 64051103		
C122	CC 820NF+-10%50V7K1200VIE CERAMIC CAPACITOR AEROVOX CKR06BX824KL	CC 084.5521	
C123	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C132			
C137	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C138	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C140	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C151	CC 1,8NF+-10%100V5K1200VI CERAMIC CAPACITOR AEROVOX CKR05BX182KL	CC 084.5296	
C153	CK 220NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,22UF/5%	CK 099.2952	
C155	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C179	CC 1UF+-10%50V7K1200VIEL CAPACITOR AEROVOX CKR06BX105KL	CC 084.5538	
C180	CC 1UF+-10%50V7K1200VIEL CAPACITOR AEROVOX CKR06BX105KL	CC 084.5538	
C181	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C183	CC 100NF+-10%50V5K1200VIE CAPACITOR AEROVOX CKR05BX104KL	CC 084.5350	
C185	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C186	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C189	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C190	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C195	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR AEROVOX CKR05BX103KL	CC 068.4060	
C199	CE 10UF -10+100%63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELKOEK10/63	CE 022.7650	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C200	CE 10UF -10+100%63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELKOEK10/63	CE 022.7650	
C201	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C202	CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y472KFA	CC 099.8450	
BIS/TO C206			
C221	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C222	CC 150PF+-5%50VNP0 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A151JFA	CC 099.8509	
C223	CC 150PF+-5%50VNP0 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A151JFA	CC 099.8509	
C224	CC 150PF+-5%50VNP0 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A151JFA	CC 099.8509	
C225	CC 150PF+-5%50VNP0 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A151JFA	CC 099.8509	
C226	CC 150PF+-5%50VNP0 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A151JFA	CC 099.8509	
C230	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C237	CC 1,5PF+-0,25PF50VNP0 CH CHIP CAPACITOR VITRAMON VJ0805A1R5CFA	CC 099.6793	
C242	CC 2,1PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJ0805A2R1CFA	CC 093.5550	
C248	CC 1,5PF+-0,25PF50VNP0 CH CHIP CAPACITOR VITRAMON VJ0805A1R5CFA	CC 099.6793	
C251	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C252	CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y472KFA	CC 099.8450	
C253	CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y472KFA	CC 099.8450	
C254	CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y472KFA	CC 099.8450	
C255	CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y472KFA	CC 099.8450	
C256	CC 4,7NF+-10%50VX7R 1206	CC 099.8450	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y472KFA		
C266	CC 150PF+-5%50VNP0 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A151JFA	CC 099.8509	
C270	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C271	CC 220PF+-2%6X7N750 CAPACITOR VALVO 2222 678 58221	CC 087.6941	
C273	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C275	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C297	CC 1,5PF+-0,25PF50VNP0 CH CHIP CAPACITOR VITRAMON VJ0805A1R5CFA	CC 099.6793	
C312	CC 9,1 PF+-0,25PF5NP0 CAPACITOR DRALORIC SE5,9/0,25 NP0	CC 022.4667	
C322	CC 9,1 PF+-0,25PF5NP0 CAPACITOR DRALORIC SE5,9/0,25 NP0	CC 022.4667	
C332	CC 9,1 PF+-0,25PF5NP0 CAPACITOR DRALORIC SE5,9/0,25 NP0	CC 022.4667	
C342	CC 9,1 PF+-0,25PF5NP0 CAPACITOR DRALORIC SE5,9/0,25 NP0	CC 022.4667	
C351	CT TRIMMKONDENS.1,5...5PF TRIMMER KYOCERA TCR 3P 1,5-5 PF	527.2650	397.0378
C352	CT TRIMMKONDENS.1,5...5PF TRIMMER KYOCERA TCR 3P 1,5-5 PF	527.2650	
C353	CT TRIMMKONDENS.1,5...5PF TRIMMER KYOCERA TCR 3P 1,5-5 PF	527.2650	
C354	CT TRIMMKONDENS.1,5...5PF TRIMMER KYOCERA TCR 3P 1,5-5 PF	527.2650	
C355	CT TRIMMKONDENS.1,5...5PF TRIMMER KYOCERA TCR 3P 1,5-5 PF	527.2650	
C362	CT TRIMMKONDENS.1,5...5PF TRIMMER KYOCERA TCR 3P 1,5-5 PF	527.2650	
BIS/TO C365			
C370	CC 3,4PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJ0805A3R4CFA	CC 093.5608	
C371	CT TRIMMKONDENS.1,5...5PF TRIMMER	527.2650	

395.0026-0431

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	KYOCERA TCR 3P 1,5-5 PF		
C375	CC 150PF+-5%50VNP0 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A151JFA	CC 099.8509	
H1	AF HLMP0301 LED RT RE LED HEWLETT-P. HLMP0301	AF 291.4429	
L1	LD 18,0UH10%3,100HM0,149A CHOKE DELEVAN DROSSEL1025-50	LD 067.3018	
L2	LD 1,00UH10%1,000HM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L3	LD 1,00UH10%1,000HM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L6	LUFTSPULE	354.6116	
L7	LD 0,33UH10%0,220HM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L31	LD 0,33UH10%0,220HM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L33	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L34	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L51	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L53	LUFTSPULE	397.0332	
L54	LUFTSPULE	397.0332	
L55	LD 1,20UH10%0,180HM0,620A CHOKE DELEVAN DROSSEL1025-22	LD 067.2870	
L57	SPULE	354.6039	
L58	LD 0,064UH/33,7PF G85 COMPONEX 301AN-0300	303.9030	
L60	LD 1,20UH10%0,180HM0,620A CHOKE DELEVAN DROSSEL1025-22	LD 067.2870	
L61	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L63	LUFTSPULE	397.0349	
L64	LUFTSPULE	397.0349	
L65	LD 0,39UH10%0,300HM0,710A CHOKE DELEVAN DROSSEL1025-10	LD 067.2811	
L68	SPULE	354.6051	
L70	LD 0,39UH10%0,300HM0,710A CHOKE DELEVAN DROSSEL1025-10	LD 067.2811	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L76	LD 0,33UH10%0,220HM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L77	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L78	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L84	LD 0,33UH10%0,220HM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L123	LD 1,20UH10%0,180HM0,620A CHOKE DELEVAN DROSSEL1025-22	LD 067.2870	
L125	LD 1,20UH10%0,180HM0,620A CHOKE DELEVAN DROSSEL1025-22	LD 067.2870	
L129	LD 1,20UH10%0,180HM0,620A CHOKE DELEVAN DROSSEL1025-22	LD 067.2870	
L131	LD 1,20UH10%0,180HM0,620A CHOKE DELEVAN DROSSEL1025-22	LD 067.2870	
L183	LD 8,20UH10%2,700HM0,160A CHOKE DELEVAN DROSSEL1025-42	LD 067.2970	
L201	DROSSEL	397.0310	
L202	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L203	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L204	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L205	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L206	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L251	DROSSEL	397.0310	
L252	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L253	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L254	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L255	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L256	LD 0,22UH10%0,140HM1,045A	LD 067.2786	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	CHOKE		
	DELEVAN DROSSEL1025-04		
L270	DROSSEL	397.0310	
L275	DROSSEL	397.0310	
L279	DROSSEL	397.0310	
L280	DROSSEL	397.0310	
L285	SPULE	354.6180	
L312	SPULE	354.6197	
L322	SPULE	354.6197	
L333	SPULE	354.6197	
L343	SPULE	354.6197	
L351	DD CU-SCH.DR.RDO,4GALAGBL WIRE	DD 025.0110	397.0355
	LEONISCHE S.K-BL. DD2101		
F L351	SPULE	397.0355	
L353	ENTHALTEN IN/INCLUDED IN 354.6016 GEAETZT		
L354	SPULE	397.0384	397.0378
L361	SPULE	397.0361	
F L361	DD CU-SCH.DR.RDÜ,4GALAGBL WIRE	DD 025.0110	397.0361
	LEONISCHE S.K-BL. DD2101		
L363	ENTHALTEN IN/INCLUDED IN 354.6016 GEAETZT		
L401	DROSSEL	397.0310	
N1	BM OM350 VHF/UHF-BB-VERST	BM 334.4953	
	IC VHF/UHF AMPL.OM 350		
	VALVO OM350		
N2	BM OM350 VHF/UHF-BB-VERST	BM 334.4953	
	IC VHF/UHF AMPL.OM 350		
	VALVO OM350		
N3	BO LF357N BIFET-OP.AMP.	BO 092.8184	
	BO LF357N BIFET-OP.AMP.		
	NSC LF357N		
N4	BO TL044MJ 4XOP-AMPL.	BO 302.5248	
	IC OPERATION AMPLIFIER TL		
	TEXAS TL044MJ		
N5	BM OM350 VHF/UHF-BB-VERST	BM 334.4953	
	IC VHF/UHF AMPL.OM 350		
	VALVO OM350		
N6	BM OM350 VHF/UHF-BB-VERST	BM 334.4953	
	IC VHF/UHF AMPL.OM 350		
	VALVO OM350		
N9	BO LM224D 4FACH OP-AMP.	BO 291.0481	
	IC OPERATION AMPLIFIER LM		
	NSC LM224D		
N10	BO LM224D 4FACH OP-AMP.	BO 291.0481	
	IC OPERATION AMPLIFIER LM		
	NSC LM224D		
N11	BO LM224D 4FACH OP-AMP.	BO 291.0481	
	IC OPERATION AMPLIFIER LM		
	NSC LM224D		
N12	BO LM224D 4FACH OP-AMP.	BO 291.0481	
	IC OPERATION AMPLIFIER LM		
	NSC LM224D		
N14	BD 20DB-VERSTAERKER	910.4620	

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Kennzeichen Component No.	Benennung/Beschreibung. Designation	Sachnummer Stock No.	enthalten in contained in
	AMPLIFIER 20DB DUENNSCHICHT SPEZ.TEIL		
N15	BD 20DB-VERSTAERKER AMPLIFIER 20DB DUENNSCHICHT SPEZ.TEIL	910.4620	
N18	BO ICL7650CTY PREC.OP.AMP ICL7650CTY PREC.OP.AMP INTERSIL ICL7650CTY	BO 343.0263	
N19	BO ICL7650CTY PREC.OP.AMP ICL7650CTY PREC.OP.AMP INTERSIL ICL7650CTY	BO 343.0263	
N20	BO LF355N BIFET.OP-AMP. IC OPERATION AMPLIFIER LF NSC LF355N	BO 092.8161	
N22	BD 20DB-VERSTAERKER AMPLIFIER 20DB DUENNSCHICHT SPEZ.TEIL	910.4620	
N25	BD ESVP-VERSTAERKER ESVP AMPLIFIER DUENNSCHICHT SPEZ.TEIL	912.0209	
R1	RL 0,35W 39,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/39,2OHM-F-D	RL 082.9420	
R2	RL 0,35W12,10 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,10HM-F-D	RL 082.8930	
R3	RL 0,35W 39,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/39,2OHM-F-D	RL 082.9420	
R6	RL 0,35W 200 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/200OHM-F-D	RL 083.0049	
R7	RL 0,35W 10,0K0HM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R10	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R11	RL 0,35W 200 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/200OHM-F-D	RL 083.0049	
R15	RL 0,35W12,10 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,10HM-F-D	RL 082.8930	
R19	RL 0,21W 511 OHM+-1%TK50 RESISTOR	RL 092.0219	
R20	RF 0,25W 2,2 OHM+-5% RESISTOR DRALORIC LCA0207/+-5%2,2	RF 073.8730	
R31	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R32	RL 0,35W12,10 OHM+-1%TK5C RESISTOR DRALORIC SMA0207/12,10HM-F-D	RL 082.8930	
R34	RF 0,25W 2,2 OHM+-5%	RF 073.8730	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	RESISTOR		
	DRALORIC LCA0207/+-5%2,2		
R35	RL 0,21W 511 OHM+-1%TK50	RL 092.0219	
	RESISTOR		
R36	RL 0,21W 511 OHM+-1%TK50	RL 092.0219	
	RESISTOR		
R37	RL 0,35W 51,1 OHM+-1%TK50	RL 082.9536	
	RESISTOR		
	DRALORIC SMA0207/51,1OHM-F-D		
R38	RL 0,35W 392 OHM+-1%TK50	RL 082.2183	
	RESISTOR		
	DRALORIC SMA0207/392K-F-C		
R40	RL 0,21W 511 OHM+-1%TK50	RL 092.0219	
	RESISTOR		
R41	RL 0,35W 2,21KOHM+-1%TK50	RL 082.2477	
	RESISTOR		
	DRALORIC SMA 0207/2,21K-F-C		
R42	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R47	RL 0,35W 2,21KOHM+-1%TK50	RL 082.2477	
	RESISTOR		
	DRALORIC SMA 0207/2,21K-F-C		
R48	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R51	RL 0,21W 392 OHM+-1%TK50	RL 092.1396	
	RESISTOR		
	RESISTA MK1 392OHM 1% TK50		
R52	RL 0,35W 10,0 OHM+-1%TK50	RL 082.8852	
	RESISTOR		
	DRALORIC SMA0207/100HM-F-D		
R53	RL 0,35W 100 OHM+-1%TK50	RL 082.6543	
	DEPOS.-CARBON RESISTOR		
	DRALORIC SMA0207/100/HM-F-D		
R54	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R61	RL 0,21W 150 OHM+-1%TK50	RL 092.1344	
	RESISTOR		
	RESISTA MK1 150OHM 1% TK50		
R62	RL 0,35W 10,0 OHM+-1%TK50	RL 082.8852	
	RESISTOR		
	DRALORIC SMA0207/100HM-F-D		
R63	RL 0,35W 100 OHM+-1%TK50	RL 082.6543	
	DEPOS.-CARBON RESISTOR		
	DRALORIC SMA0207/100/HM-F-D		
R64	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R67	RL 0,21W 100 OHM+-1%TK50	RL 092.1321	
	DEPOS.-CARBON RESISTOR		
	RESISTA MK1 100OHM 1% TK50		
R70	RL 0,21W 332 OHM+-1%TK50	RL 092.1380	
	RESISTOR		
	RESISTA MK1 332OHM 1% TK50		
R71	RL 0,35W 182 OHM+-1%TK50	RL 083.0010	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	RESISTOR		
	DRALORIC SMA0207/1820HM-F-D		
R72	RL 0,35W 182 OHM+-1%TK50	RL 083.0010	
	RESISTOR		
	DRALORIC SMA0207/1820HM-F-D		
R73	RL 0,35W 68,1 OHM+-1%TK50	RL 082.9636	
	RESISTOR		
	DRALORIC SMA0207/68,10HM-F-D		
R74	RL 0,35W 82,5 OHM+-1%TK50	RL 082.9707	
	RESISTOR		
	DRALORIC SMA0207/82,50HM-F-D		
R75	RL 0,35W 82,5 OHM+-1%TK50	RL 082.9707	
	RESISTOR		
	DRALORIC SMA0207/82,50HM-F-D		
R77	RL 0,35W22,10 OHM+-1%TK50	RL 082.9188	
	RESISTOR		
	DRALORIC SMA0207/22,10HM-F-D		
R78	RL 0,35W22,10 OHM+-1%TK50	RL 082.9188	
	RESISTOR		
	DRALORIC SMA0207/22,10HM-F-D		
R79	RL 0,35W15 OHM 1%TK50	RL 082.9020	
	RESISTOR		
	DRALORIC SMA0207/150HM-F-D		
R80	RL 0,35W 10,0 OHM+-1%TK50	RL 082.8852	
	RESISTOR		
	DRALORIC SMA0207/100HM-F-D		
R81	RL 0,35W 221 OHM+-1%TK50	RL 083.0084	
	RESISTOR		
	DRALORIC SMA0207/2210HM-F-D		
R82	RL 0,35W22,10 OHM+-1%TK50	RL 082.9188	
	RESISTOR		
	DRALORIC SMA0207/22,10HM-F-D		
R85	RL 0,35W22,10 OHM+-1%TK50	RL 082.9188	
	RESISTOR		
	DRALORIC SMA0207/22,10HM-F-D		
R86	RF 0,25W 5,6 OHM +-5%	RF 074.0056	
	RESISTOR		
	DRALORIC LCA0207/+-5%5,6		
R87	RL 0,35W 221 OHM+-1%TK50	RL 083.0084	
	RESISTOR		
	DRALORIC SMA0207/2210HM-F-D		
R91	RL 0,21W 82 OHM2% UNGEW.	RL 092.5940	
	RESISTOR		
	RESISTA MK1 820HM 2% UNGEW.		
R92	RL 0,21W 82 OHM2% UNGEW.	RL 092.5940	
	RESISTOR		
	RESISTA MK1 820HM 2% UNGEW.		
R93	RL 0,21W 82 OHM2% UNGEW.	RL 092.5940	
	RESISTOR		
	RESISTA MK1 820HM 2% UNGEW.		
R96	RL 0,21W 120 OHM2% UNGEW.	RL 092.5962	
	RESISTOR		
	RESISTA MK1 1200HM 2% UNGEW.		
R97	RL 0,21W 47 OHM2% UNGEW.	RL 092.5910	
	RESISTOR		
	RESISTA MK1 470HM 2% UNGEW.		
R98	RL 0,21W 120 OHM2% UNGEW.	RL 092.5962	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	RESISTOR		
	RESISTA MK1 1200HM 2% UNGEW.		
R99	RF 0,25W 2,2 OHM+-5%	RF 073.8730	
	RESISTOR		
	DRALORIC LCA0207/+-5%2,2		
R100	RF 0,25W 2,2 OHM+-5%	RF 073.8730	
	RESISTOR		
	DRALORIC LCA0207/+-5%2,2		
R101	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R102	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R103	RL 0,25W 47,5KOHM+-1%TK50	RL 083.1800	
	RESISTOR		
	DRALORIC SMA/207/47,5K-F-C		
R104	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R105	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R106	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R108	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R110	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R112	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R114	RL 0,35W 274 OHM+-1%TK50	RL 083.0178	
	RESISTOR		
	DRALORIC SMA0207/2740HM-F-D		
R116	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R140	RL 0,35W 5,62KOHM+-1%TK50	RL 082.2190	
	RESISTOR		
	DRALORIC SMA0207/5,62K-F-C		
R151	RL 0,35W 82,5KOHM+-1%TK50	RL 082.2302	
	RESISTOR		
	DRALORIC SMA0207/82,5K-F-C		
R152	RL 0,21W 1,00KOHM+-1%TK50	RL 092.1444	
	RESISTOR		
	RESISTA MK1 1K00 1% TK50		
	TRIMMWERT		
R153	RL 0,35W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
R154	RL 0,21W 4,75KOHM+-1%TK50	RL 092.1521	
	RESISTOR		
	RESISTA MK1 4K75 1% TK50		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R155	RL 0,21W 10,0KOHM+-1%TK50 RESISTOR	RL 092.1567	
	RESISTA MK1 10K0 1% TK50		
R158	RL 0,21W 1,00KOHM+-1%TK50 RESISTOR	RL 092.1444	
	RESISTA MK1 1K00 1% TK50		
R160	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	
	DRALORIC SMA0207/1K-F-C		
R161	RL 0,35W 8,25KOHM+-1%TK50 RESISTOR	RL 083.1239	
	DRALORIC SMA0207/8,25K-F-D		
R162	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	
	DRALORIC SMA0207/1K-F-C		
R163	RL 0,35W 475 KOHM+-1%TK50 RESISTOR	RL 083.2593	
	DRALORIC SMA/207/475K-F-C		
R165	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	
	DRALORIC SMA0207/10K-F-D		
R166	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR	RL 083.0926	
	DRALORIC SMA0207/2,74K-F-D		
R170	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	
	DRALORIC SMA0207/10K-F-D		
R172	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	
	DRALORIC SMA0207/10K-F-D		
R173	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR	RL 083.0990	
	DRALORIC SMA0207/3,32K-F-D		
R175	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	
	DRALORIC SMA0207/10K-F-D		
R177	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	
	DRALORIC SMA0207/10K-F-D		
R180	RL 0,35W 332 OHM+-1%TK50 RESISTOR	RL 083.0255	
	DRALORIC SMA0207/332OHM-F-D		
R181	RL 0,35W 511 OHM+-1%TK50 RESISTOR	RL 083.0426	
	DRALORIC SMA0207/511OHM-F-D		
R182	RL 0,35W 3,92KOHM+-1%TK50 RESISTOR	RL 083.1039	
R183	RL 0,25W 47,5KOHM+-1%TK50 RESISTOR	RL 083.1800	
	DRALORIC SMA/207/47,5K-F-C		
R184	RL 0,35W4,75MOHM+-1%TK50 METALFILMRESISTOR	-RL 099.8250	
	RESISTA MK2 4,75MOHM 1% TK50		
R185	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR	RL 082.6543	
	DRALORIC SMA0207/100/HM-F-D		
R187	RL 0,35W 16,2KOHM+-1%TK50	RL 083.1439	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	RESISTOR		
	DRALORIC SMA0207/16,2K-F-D		
R188	RL 0,21W 10,0KOHM+-1%TK50	RL 092.1567	
	RESISTOR		
	RESISTA MK1 10K0 1% TK50		
R189	RL 0,21W 10,0KOHM+-1%TK50	RL 092.1567	
	RESISTOR		
	RESISTA MK1 10K0 1% TK50		
R191	RL 0,35W 8,25KOHM+-1%TK50	RL 083.1239	
	RESISTOR		
	DRALORIC SMA0207/8,25K-F-D		
R192	RL 0,35W 475 OHM+-1%TK50	RL 083.0390	
	RESISTOR		
	DRALORIC SMA0207/475OHM-F-D		
R193	RS 0,75W 1KOHM+-10%CERMET	RS 037.7367	
	DEPOS.-CARBON POTENTIOMET		
	BOURNS 3006P-1-1 KOHM+-10%		
R194	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R195	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R196	RL 0,35W 3,32KOHM+-1%TK50	RL 083.0990	
	RESISTOR		
	DRALORIC SMA0207/3,32K-F-D		
R197	RG 0,25W 50MOHM+-2% TK100	397.0278	
	THICK FILM RESISTOR		
	ELECTRONIC CS005,50MOHM+-2%		
R200	RL 0,21W 100 OHM+-1%TK50	RL 092.1321	
	DEPOS.-CARBON RESISTOR		
	RESISTA MK1 100OHM 1% TK50		
R201	RL 0,21W 2,21KOHM+-1%TK50	RL 092.1480	
	RESISTOR		
	RESISTA MK1 2K21 1% TK50		
BIS/TO R206			
R211	RL 0,21W 1,00KOHM+-1%TK50	RL 092.1444	
	RESISTOR		
	RESISTA MK1 1K00 1% TK50		
BIS/TO R216			
R230	RL 0,21W 511 OHM+-1%TK50	RL 092.0219	
	RESISTOR		
R235	RL 0,21W 1,00KOHM+-1%TK50	RL 092.1444	
	RESISTOR		
	RESISTA MK1 1K00 1% TK50		
R251	RL 0,21W 2,21KOHM+-1%TK50	RL 092.1480	
	RESISTOR		
	RESISTA MK1 2K21 1% TK50		
BIS/TO R256			
R261	RL 0,21W 1,00KOHM+-1%TK50	RL 092.1444	
	RESISTOR		
	RESISTA MK1 1K00 1% TK50		
BIS/TO R266			

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R270	RL 0,21W 1,00KOHM+-1%TK50 RESISTOR RESISTA MK1 1K00 1% TK50	RL 092.1444	
R272	RF 0,25W 2,2 OHM+-5% RESISTOR DRALORIC LCA0207/+-5%2,2	RF 073.8730	
R273	RL 0,21W 511 OHM+-1%TK50 RESISTOR	RL 092.0219	
R275	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R278	RL 0,21W 475 OHM+-1%TK50 RESISTOR RESISTA MK1 475OHM 1% TK50	RL 092.1409	
R279	RL 0,21W 475 OHM+-1%TK50 RESISTOR RESISTA MK1 475OHM 1% TK50	RL 092.1409	
R280	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R351	RL 0,21W 100 KOHM+-1%TK50 RESISTOR RESISTA MK1 100K 10% TK50	RL 092.1680	
R352	RL 0,21W 100 KOHM+-1%TK50 RESISTOR RESISTA MK1 100K 10% TK50	RL 092.1680	
R362	RL 0,21W 100 KOHM+-1%TK50 RESISTOR RESISTA MK1 100K 10% TK50	RL 092.1680	
R370	RL 0,21W 100 KOHM+-1%TK50 RESISTOR RESISTA MK1 100K 10% TK50	RL 092.1680	
R375	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R401	RL 0,21W 150 OHM+-1%TK50 RESISTOR RESISTA MK1 150OHM 1% TK50	RL 092.1344	
R402	RL 0,21W 150 OHM+-1%TK50 RESISTOR RESISTA MK1 150OHM 1% TK50	RL 092.1344	
R403	RL 0,21W 150 OHM+-1%TK50 RESISTOR RESISTA MK1 150OHM 1% TK50	RL 092.1344	
R405	RF 0,25W 2,2 OHM+-5% RESISTOR DRALORIC LCA0207/+-5%2,2	RF 073.8730	
U1	BM TFM-2 MIXER 1-1000MHZ IC MIXER TFM-2 MCL TFM-2	BM 302.6080	
U2	BM TFM-2 MIXER 1-1000MHZ IC MIXER TFM-2 MCL TFM-2	BM 302.6080	
U3	BM TFM-2 MIXER 1-1000MHZ IC MIXER TFM-2 MCL TFM-2	BM 302.6080	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V1	AM BF247A NKAN 25V FET FET TEXAS BF247A	AM 247.6536	
V2	AM BF247C NKAN 25V FET FET TEXAS BF247C	209.0211	
V30	AK BC327-40 PNP 45V 800MA TRANSISTOR INTERMETAL BC327-40	AK 303.9518	
V40	AK BC327-40 PNP 45V 800MA TRANSISTOR INTERMETAL BC327-40	AK 303.9518	
V51	AM BF256A NKAN 30V FET FET TELEDYNE BF256A	AM 010.8885	
V52	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V61	AM BF256A NKAN 30V FET FET TELEDYNE BF256A	AM 010.8885	
V62	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V140	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V141	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V151	AK BC337-40 NPN 45V 800MA TRANSISTOR INTERMETAL BC337-40	AK 303.9524	
V153	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V154	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V155	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V156	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V157	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V160	AK BC327-40 PNP 45V 800MA TRANSISTOR INTERMETAL BC327-40	AK 303.9518	
V161	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V163	AK BC327-40 PNP 45V 800MA TRANSISTOR	AK 303.9518	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	INTERMETAL BC327-40		
V165	AK BC337-40 NPN 45V 800MA TRANSISTOR	AK 303.9524	
	INTERMETAL BC337-40		
V166	AD 1N4531 75V 0,15A UDI DIODE	AD 082.6514	
	UNITRODE 1N4531		
V170	AD 1N4531 75V 0,15A UDI DIODE	AD 082.6514	
	UNITRODE 1N4531		
V171	AD 1N4531 75V 0,15A UDI DIODE	AD 082.6514	
	UNITRODE 1N4531		
V173	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE	AE 012.2432	
	VALVO BZX79/C4V7		
V190	AD 1N4531 75V 0,15A UDI DIODE	AD 082.6514	
	UNITRODE 1N4531		
V200	AE BZX79/C8V2 0,5W Z-DI ZENER DIODE	AE 012.2490	
	VALVO BZX79/C8V2		
V201	AD 1N4531 75V 0,15A UDI DIODE	AD 082.6514	
	UNITRODE 1N4531		
BIS/TO V206			
V221	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		
V222	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		
V223	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		
V226	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		
V227	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		
V228	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		
V231	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		
V232	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		
V233	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		
V236	AE 5082-3379 50V PINDI PINDIODE	AE 397.0049	
	HP HP 5082-3379		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V237	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V238	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V241	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V242	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V243	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V246	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V247	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V248	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V251	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
BIS/TO V256			
V271	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V272	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V273	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V276	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V277	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V278	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V281	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V282	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V283	AE 5082-3379 50V PINDI PINDIODE HP HP 5082-3379	AE 397.0049	
V286	AE 5082-3379 50V PINDI	AE 397.0049	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	PINDIODE		
	HP HP 5082-3379		
V287	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V288	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V291	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V292	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V293	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V296	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V297	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V298	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V302	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V303	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V305	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V306	AE 5082-3379 50V PINDI	AE 397.0049	
	PINDIODE		
	HP HP 5082-3379		
V351	AE BB405B 11/ 2PF CDI	343.0611	
	TUNING DIODE		
	VALVO BB405B GRUPPE2/RS-LV		
V352	AE BB405B 11/ 2PF CDI	343.0611	
	TUNING DIODE		
	VALVO BB405B GRUPPE2/RS-LV		
V362	AE BB405B 11/ 2PF CDI	343.0611	
	TUNING DIODE		
	VALVO BB405B GRUPPE2/RS-LV		
V370	AE BB405B 11/ 2PF CDI	343.0611	
	TUNING DIODE		
	VALVO BB405B GRUPPE2/RS-LV		
W1	KABEL	397.0061	
W2	KABEL	397.0078	
W5	KABEL	397.0103	
W6	KABEL	397.0110	
W7	KABEL	397.0126	
W8	KABEL	397.0132	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
W9	KABEL	397.0149	
W15	KABEL	397.0203	
W16	KABEL	397.0210	
W17	KABEL	397.0226	
W18	KABEL	397.0232	
W19	KABEL	397.0249	
W134	HF-KABEL	397.0261	
X1	FJ EINBAUSTECKER SYST.SMB PLUG RADIALL	FJ 063.5168	
X2	FJ EINBAUSTECKER SYST.SMB PLUG RADIALL	FJ 063.5168	
X3	FJ EINBAUSTECKER SYST.SMB PLUG RADIALL	FJ 063.5168	
X6	FJ EINBAUSTECKER SYST.SMB PLUG RADIALL	FJ 063.5168	
X10	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X11	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X131	FP STECKERL.INDIR.64POLIG 64-PIN INSERT ERNI STV-P-264 9722.333.	FP 084.6470	
X132	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIALL R 112 669	FJ 249.9684	
X133	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIALL R 112 669	FJ 249.9684	
X134	FJ KAB.EINBAUST.SMCFUT-85 CONNECTOR SPINNER BN750500	FJ 017.6188	397.0261
			- ENDE -

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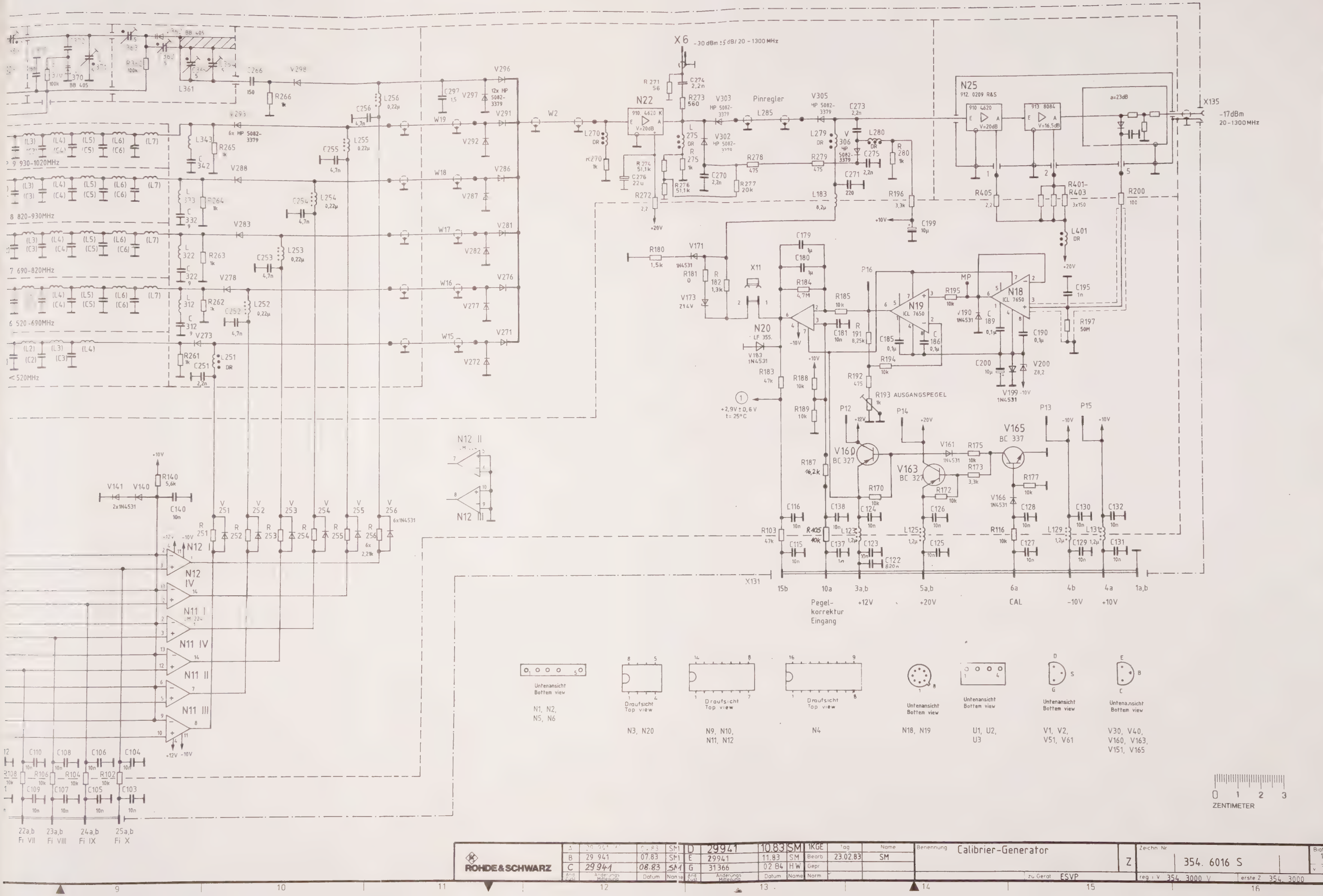
1 Local input
-15dBm +3, -2 dB
X134
W134
C92 2,7
R91 182
R92 33 a = 5dB
R93 182
N14
910. 4620 K
V=14dB
R100 2,2 +12V
R96 120
C91 2,7
R97 47 a=7,5dB
R98 120
N15
910. 4620 K
V=18dB
R99 2,2 +20V
-20dBm ± 8,-3dB
709,3 - 1330,7MHz
X3
X2
-45dBm ± 5dB
20-1300MHz
X1
R231 56
R230 560
R233 56
R232 560
R236 560
R237 56
C231 2,2n
C230 2,2n
U3
Mischer
TFM 2
R235 1k
W1
12 x HP 5082-3379
P10
P11
V30
BC 327
V40
BC 327
+12V
C41 1n
C48 1n
R41 2,2k
R42 10k
R47 2,2k
R48 10k
L33 10µ
L34 10µ
C51 1n
C61 1n
L51 10µ
L61 10µ
C52 1n
C62 1n
R52 10
R62 10
f=310,7MHz
f=810,7MHz
V51
BF 256 A
VALVO
V61
BF 256 A
VALVO
C53 330
C63 330
C65 150
C55 4,7
C50 3,9
L57
L58
L55 1,2µ
L65 0,68µ
C60 0 TW
R67 100
L68
R51
C54 22
C58 6,8
C57
C68 3,9
C59 22
R53 100
L54
L64
L63
R63 100
C69 4,7
C66 8,2 T.W.
C64 4,7
8dB
R85 22
R86 5,6
R87 220
R74 82,5
R75 82,5
C74 330
N5
OM 350
G=15dB
-10dB
C80 330
R79 15
R82 22
R80 10
C82 330
-20dBm
N6
OM 350
G=15dB
L84 0,33µ
C85 1n
R78 22
C77 1n
L77 10µ
C76 1n
R77 22
L76 0,33µ
R73 68
R72 180
R71 180
U_VCO
L78 10µ
+12V
C78 1n
MP
R69 10k
P3
P6
P7
P8
R35 511
R36 511
R40 511
-18dBm
N2
R31 100 a=4dB
R32 12
U1
Mischer
TFM 2
C31 1n
C34 1n
U2
Mischer
TFM 2
R38 390
R37 51
C36 10n
0,33µ
-10V
R151 82k
X10
V157 1N4531
+2,6V ± 0,4V/t = 25°C
C151 1,8n
R152 1k
R153 100k
N4 II
N4 I
N4 III
N4 IV
TL 044
LF 357
N3
R158 1k
C153 0,22
R162 1k
R160 1k
R161 8,2k
R163 470k
C155 4,7n
C167
V154 1N4531
V155 1N4531
V156 1N4531
+8V Fehler
-8V gefangen
R167 47,5k
R168 47,5k
V153 1N4531
R165 10k
R155 10k
V151
BC 337
V158 1N4531
C118 10n
R114 270
C158 10n
C117 10n
H1
LED
Fanganzeige
R166 2,7k
20a
Fanganzeige
V1
BF 247 A
V2
C1 6n
C2 1n
C3 18µ
C4 10n
C5 10n
C6 10n
C7 1µ
C8 10n
C9 220
C10 470
C11 220
R1 39
R2 12
R3 39
R4 10k
R7 10k
R10 10
R11 200
R15 12
R19 511
N1
OM 350
C15 15
C16 15
L6
C18 15
L7 0,33µ
C19 680
R20 4,7
+12V
X132
-12dBm ±2dB
10,7MHz
X133
2.Osz. Eingang
-12dBm ±2dB
300/800 MHz
V246
V247
L206 0,22µ
C206 4,7n
R216 1k
C74A 1,5
C226 150
V248
V352 BB 405B
C354 5
C355
L351
C352
V351 BB 405B
(C351)
(L354)
R351 100k
V241
W9
V242
C242 2,1
V243
6xHP 5082-3379
R215 1k
C225 150
L205 0,22µ
C205 4,7n
V236
W8
V237
C237 1,5
V238
C224
R214 1k
L204 0,22µ
C204 4,7n
V231
W7
V232
V233
C223
R213 1k
L203 0,22µ
C203 4,7n
V226
W6
V227
V228
C222
R212 1k
L202 0,22µ
C202 4,7n
V221
W5
V222
V223
C221 2,2n
R211 1k
L201 DR
C201 2,2n
R375 1k
V206 6x 1N4531
V205
V204
V203
V202
V201
R206 6x2,21k
R205
R204
R203
R202
R201
N10 III
LM 224
N10 II
N10 I
N10 IV
N9 II
N9 III
N9 I
N9 IV
C102 10n
C114 10n
R101 10k
R112 10k
R110 10k
C101 10n
C113 10n
X131
8a
20b
21a,b
U
<520MHz
Fi VI
Zeichn.-Nr. 354. 6016 S



Untenansicht
Bottem view

N1, N2,
N5, N6

Draufsicht
Top view

N3, N20

Draufsicht
Top view

N9, N10,
N11, N12

Draufsicht
Top view

N4

Untenansicht
Bottem view

N18, N19

Untenansicht
Bottem view

U1, U2,
U3

Untenansicht
Bottem view

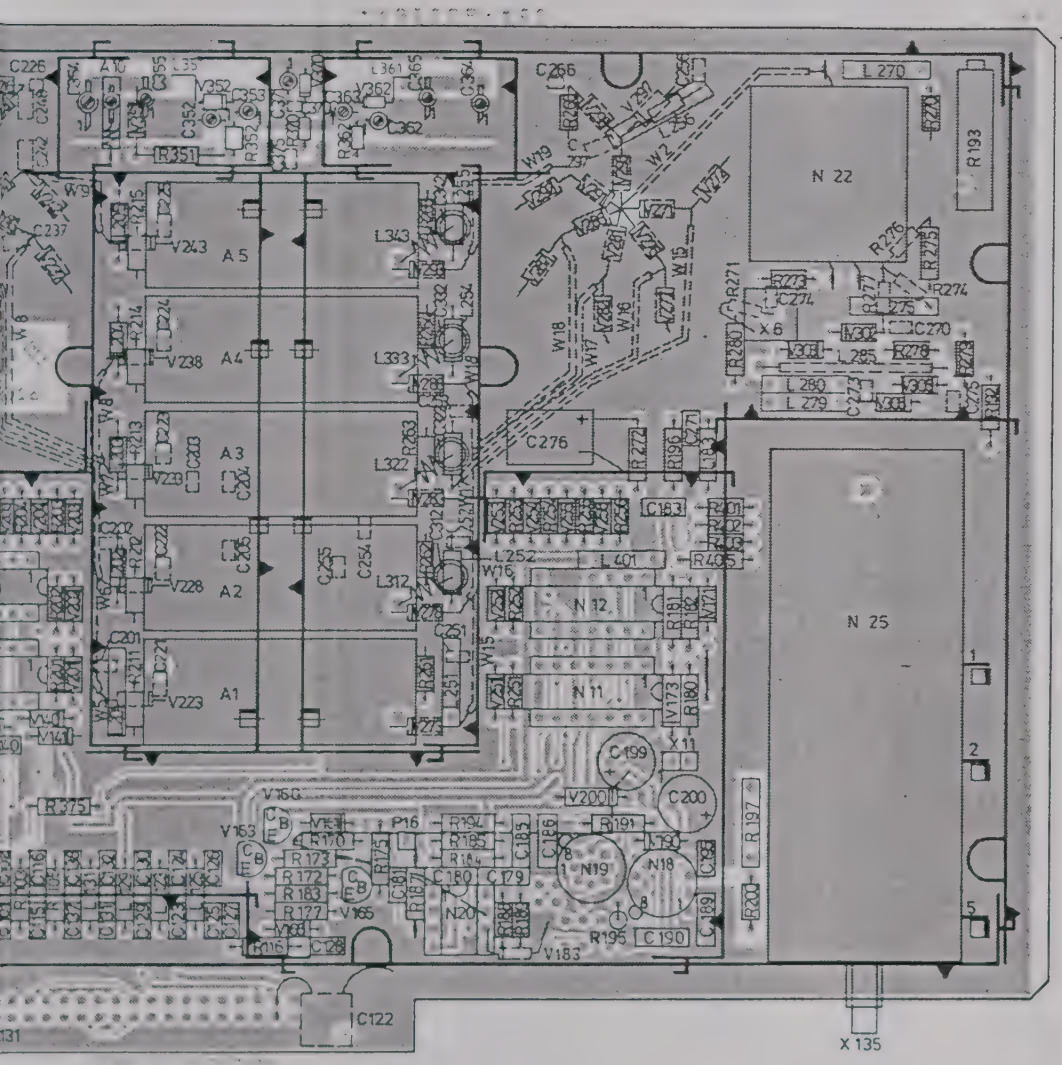
V1, V2,
V51, V61

Untenansicht
Bottem view

V30, V40,
V160, V163,
V151, V165

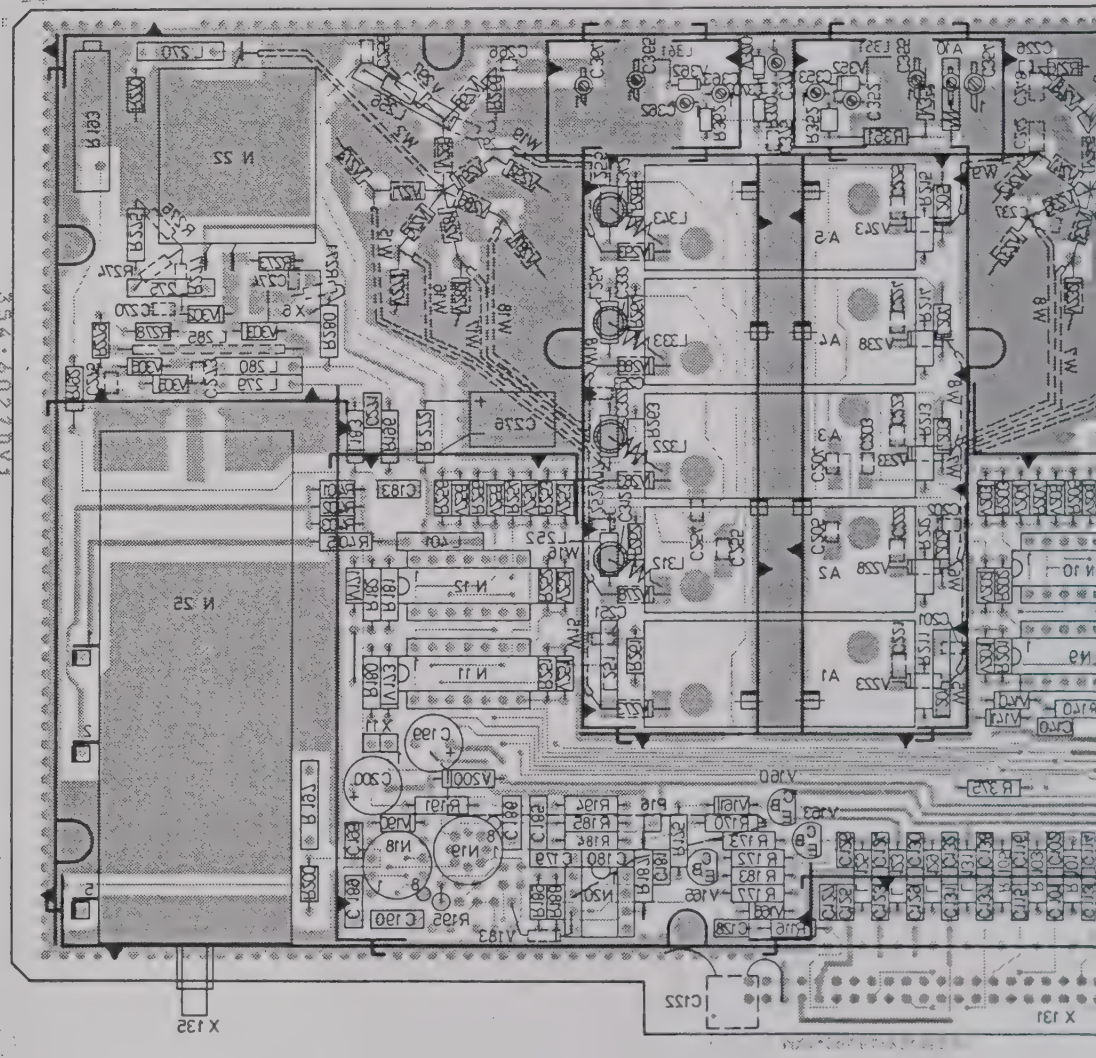
0 1 2 3
ZENTIMETER

ROHDE & SCHWARZ	A	29.941	07.83	SM	D	29941	10.83	SM	IKGE	Tag	Name	Benennung: Calibrier-Generator	Z
	B	29.941	07.83	SM	E	29941	11.83	SM	Bearb	23.02.83	SM		
	C	29.941	08.83	SM	G	31366	02.84	H.W.	Gepr			zu Gerat: FSVP	
	Änd. Index	Änderungs Mitteilung	Datum	Name	Änd. Index	Änderungs Mitteilung	Datum	Name	Norm			Zeichn Nr: 354. 6016 S	Blatt Nr: 1 v 1 Bl
												reg. v 354. 3000 V	erste Z 354. 3000



F 29941 10.83 SM	Maße ohne Toleranzangabe		Maßstab 1 : 1
			Halbzeug Werkstoff
	1KGE	Tag Name	Benennung
	bearb	10.83 SM	CAL - Generator **A** Z
	Gepr		
	Norm		
	ROHDE & SCHWARZ		Sachnr. 354.6016
Änd. Ers. Änderungs Mitteilung Tag Name	zu Gerät ESVP		354 3000V ersetzt 354 3000

Ansicht und Leitungsführung Lötseite
View of tracks on solder side



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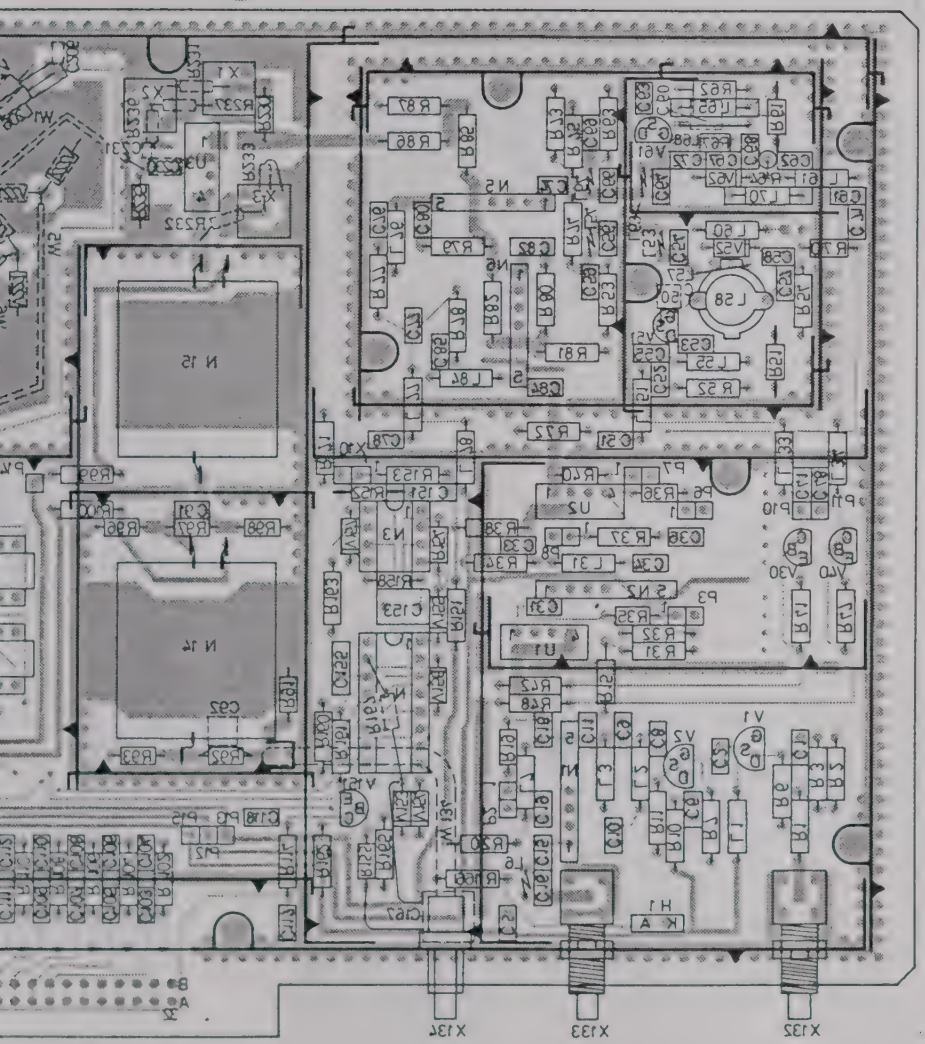

F	29941	10.83	SM	Maße ohne Toleranzangabe	Maßstab 1 : 1
					Halbzeug, Werkstoff
				nKGE / Tag / Name	Benennung
				Bearb 10.83 SM	CAL-Generator A Z
				Gepr	
				Norm	
				ROHDE & SCHWARZ	Zeichn.-Nr. 354.6016 Blatt Nr. 3
And. Zust.	Änderungs Mitteilung	Tag	Name	zu Gerat ESVP	reg. V 354.3000 V / erste Z 354.3000

SERVICE INSTRUCTIONS

Synthesizer 2

342.5003.02

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Parts list

Circuit diagram

Components location plan

5. Service Instructions for Synthesizer 2

5.1 Circuit Description

(See Fig. 4 and circuit diagram 342.5003 S)

The synthesizer 2 consists of three functional groups:

5.1.1 Reference Frequency Generation

The crystal B1 the temperature of which is internally controlled by a PTC resistor is connected in series with the two FETs V51 and V52 in a Butler circuit. The crystal oscillator can be tuned to its nominal frequency through varicap V50. In normal operation, this is accomplished with the aid of an adjustable DC voltage which is applied externally via X141.a8. In operation with an external reference frequency tuning is accomplished by means of a PLL via switch D27.

The RF oscillation boosted in V53 is applied via the decoupling power divider T4 to the two outputs X145 and X146. A buffer amplifier comprising V54 and V55 supplies a 100-MHz TTL level to D20 and prevents at the same time that the 100-MHz signal is amplitude-modulated with 50 MHz by the 2:1 divider D20. The second J-K flip-flop D20 provides division to 25 MHz. A further low-power Schottky divider produces 2.5 MHz for the 110.7-to-210.699-MHz PLL. D22 divides by 5, so does D23. As a result, a 100-kHz TTL level is present at the phase comparator D26. D24 divides once more by 10 to 10 kHz which is available at the motherboard connector via a filter section.

The external reference frequency can be fed to the synthesizer board 2 via the coaxial socket X144. If an external reference frequency of 5 MHz is applied, pin a7 is enabled causing the external frequency after division in the 10:1 divider D28 to be divided by 5 in D29. The resulting 100 kHz (5 MHz:50) control the integrator N3 via the phase comparator D26. The tuning voltage is applied via the filter section R123 and C130 to the varicap V50 to be controlled.

If an external reference frequency of 10 MHz is applied, pin b7 is enabled. As a result the divider D29 is switched over to 10:1 division ratio by V58. Thus another frequency of 100 kHz (10 MHz:100) is obtained which is required for phase synchronization.

5.1.2 110.7-to-210.699-MHz Oscillator

The 110.7-to-210.699-MHz oscillator functions as an interpolation oscillator over a 100-MHz range in steps of 1 kHz. It determines above all the synchronization time and the noise performance in the vicinity of the carrier for the complete frequency synthesis of the receiver. Essential features of the low-noise oscillator are a high-Q resonant circuit and a mechanically stable construction preventing microphony. The Hartley type oscillator transistor V14 is tuned simultaneously by two tuning voltages. For coarse tuning of the oscillator 2 x 3 tuning diodes are connected in anti-parallel. Fine tuning for synchronization is accomplished via V1. To obtain a satisfactory tuning characteristic of the frequency range of almost one octave, coupling of fine tuning is varied with coarse tuning, i.e. the gain of coarse tuning is increased at high frequencies, hence about the upper range end. The RF is applied via the output coupling coils L30 and L29 to the two buffer amplifiers. V13 the operating point of which is kept constant by means of a control loop comprising V12 supplies an RF power of > +2 dBm to X142. Finally, the RF is applied to the PLL via a further buffer amplifier consisting of V11 and V10.

5.1.3 Phase-lock Loop

The phase-lock loop consists of a 5-decade (n x 10 MHz to n x 1 kHz) parallel-serial converter with conversion from 5-V to 10-V logic. The 20 control lines (= five decades in BCD) are present at the input of the two data multiplexers D1 and D2. The control inputs 10, 11 and 14 are enabled via a diode matrix consisting of V32 to V40 so that the information of the individual frequency decades is available at the four inputs (4, 5, 11, 12) of the inverting level shifter D3 at time intervals of 1.25 kHz (10 kHz:8) in 5-V logic. After conversion to 10-V logic, this information controls D6 (see Fig. 1).

This universal divider module in LSI technique controls the series-connected 10/11:1 dividers D4 and D5 and moreover further divides the divided frequency as programmed to produce the frequency control information and the desired synchronization frequency. The control of the prescalers via the lines SY, FB1 and FB2 with the aid of the auxiliary circuits D7, D8 and D9 is shown in Fig. 2.

The offset between the frequency entered and the frequency of synthesizer 2 is given by the equation:

$$f_{synth2} = f + 110.7 \text{ MHz}.$$

This offset is taken into consideration in the diode matrix V22 to V27 by provision of a subtracter.

Example:

Setting of the five decades: 12.345 MHz
(data A for subtracter)
Offset: 110.700 MHz
Desired frequency: 123.045
Data B = 1 000 000 - 110 700 = 889300

Data B is called up via the inputs D0 to D5. Since the last two digits of B are 0, only D2 to D5 are connected to the B outputs via appropriate diodes.

The fixed programmed internal divider stages of the LSI circuit are controlled by D6 (in active low format via V18 to V21). A noteworthy feature of this control is the production of 1-kHz increments from a reference frequency of 10 kHz (pin 13) (fractional division).

The second LSI circuit D10 supplies the clock frequency of 10 kHz to D6. It divides the incoming reference frequency of 2.5 MHz (TTL) which is converted to +10-V logic level by 250 (N_S divider: 10, N_T divider: 25). Furthermore, D10 contains two phase discriminators:

PC1
The special circuitry of this sample + hold phase discriminator provides the high gain of 3000 V/2π and low crosstalk of the reference frequency.

PC2
This conventional digital phase discriminator supplies positive or negative output pulses depending on the phase relation of its two input signals with a pulse duration corresponding to the phase difference. The integrator N1 converts the output pulses into the control voltage for coarse tuning. The phase discriminator becomes inactive in a sub-range about the centre of its characteristic in which only the PC1 synchronizes the loop.

In addition, D10 contains an auxiliary circuit which sends an out-of-lock signal via pin 4 as soon as the complete control loop is unlocked. After it has been inverted in V28 this signal controls further auxiliary circuits the operating principle of which is as follows:

Operating principle of PLL (see Fig. 3)

The PLL is assumed to be out of lock after frequency switching by changing the BCD code at the control decades:

1. Synchronization indication (pin a10) goes low.
   This considerably increases the limit frequency of the low-pass filter via the timer D14, D11, V41 and V42 by by-passing R25 with V42.

2. The inactive phase discriminator PC2 in the locked state causes a low-impedance current to be applied to the integrator N1 for acceleration of synchronization. The active low-pass filter N2 with a cut-off frequency of approximately 1 kHz changes the direction of coarse tuning of the VCO as required.

3. The locked state is restored. PC2 is disabled and PC1 is exclusively responsible for the control. D14 resets with a delay the low-pass filter to the slow time constant.

4. At frequencies at which the leading decade reaches the value 8 or 9 the gain is switched over by D12 according to the change in the division ratio and the oscillator gain.

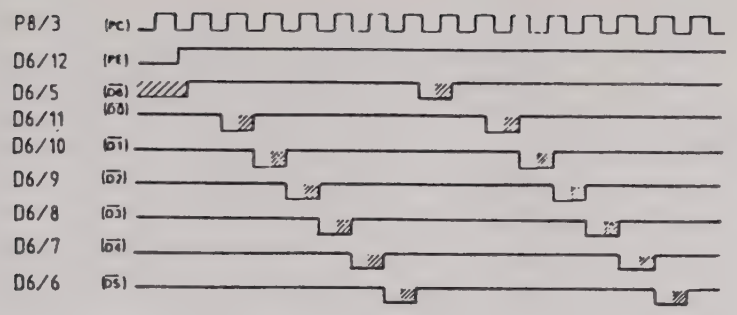


Fig. 1 Control of the data multiplexers D1, D2 by D6

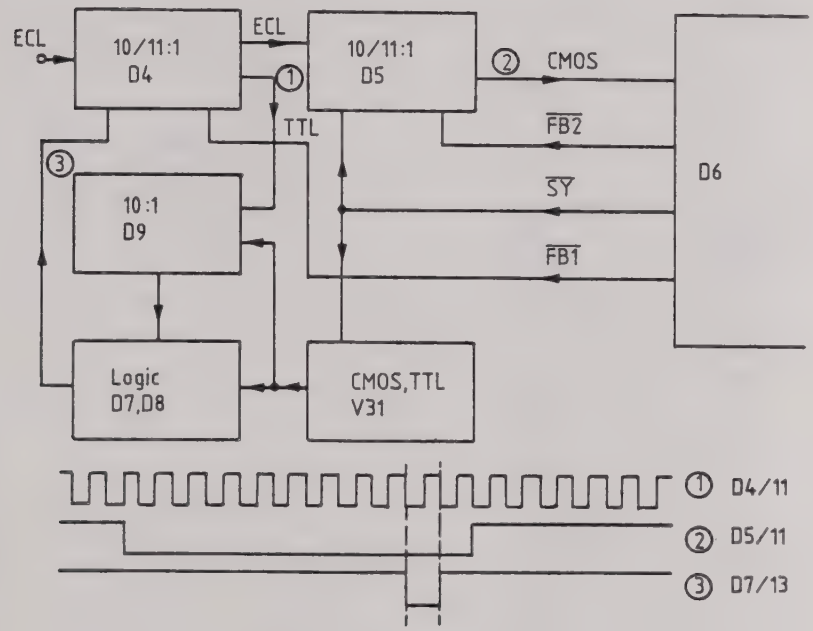


Fig. 2 Control of the prescalers D4, D5

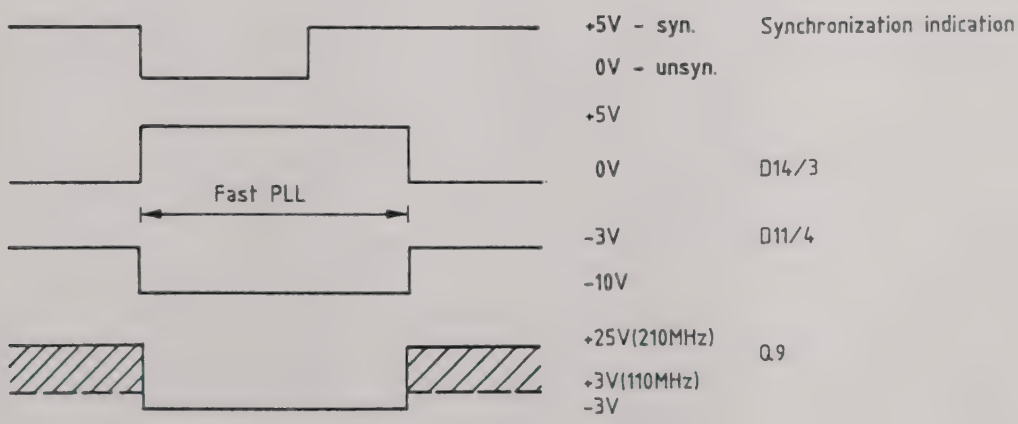


Fig. 3 Synchronization process

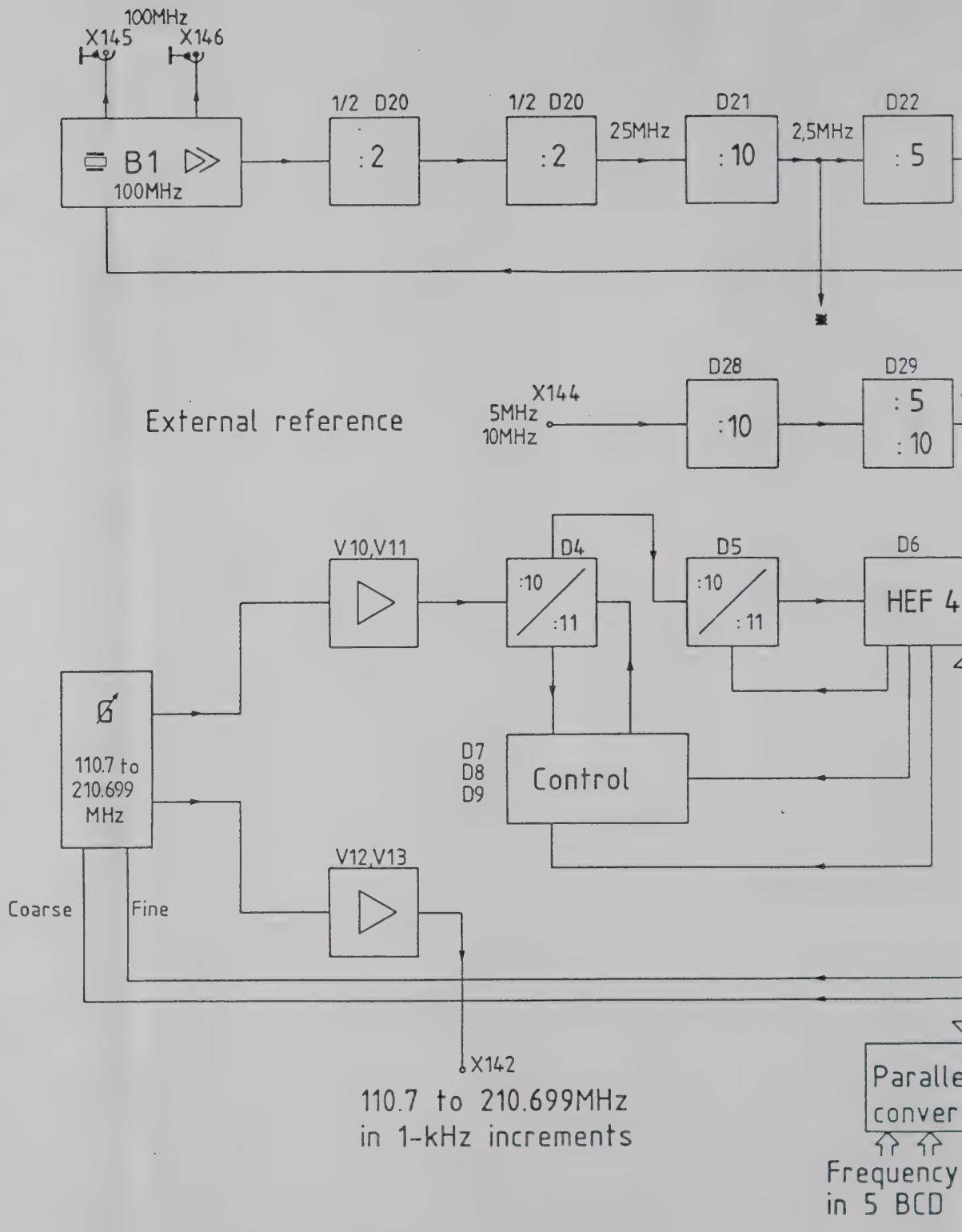
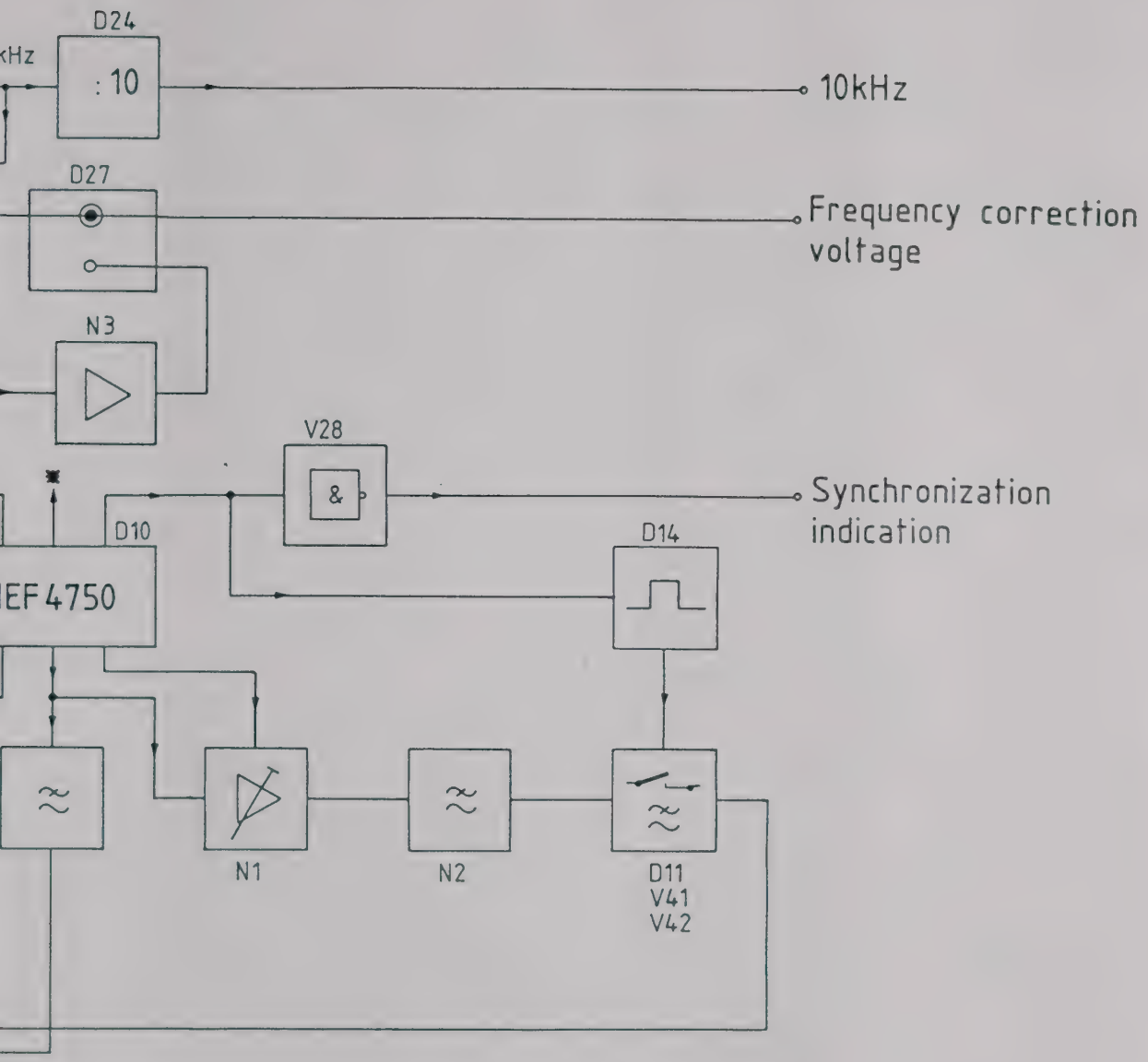


Fig. 4 Block diagram of synthesizer 2


D24
: 10
10kHz
D27
Frequency correction
voltage
N3
V28
&
Synchronization
indication
D10
D14
N1
N2
D11
V41
V42

Checking the current drain:

Voltage	Tolerance	Current	Tolerance	Pin
+5.40 V	±0.05 V	160 mA	±40 mA	a2, b2
+10 V	±10 mV	6 mA	± 2 mA	a4
+12 V	±0.1 V	70 mA	±10 mA	a3, b3
+30 V	±0.1 V	9 mA	± 2 mA	a5
-10 V	±0.1 V	5 mA	± 1 mA	b4
0 V	-	-	-	a1, b1, a31, b31

Adjustment of the reference circuit
(See circuit diagram 342.5003 S, sheet 2)

It is assumed that all voltages are applied and the current drain has been checked. In addition, +5 V ±0.2 V is applied to a8. Connect an analyzer to X145 or X146. Terminate the second output with 50 Ω. Adjust L901 so as to ensure proper oscillation build-up of the oscillator (switch on and off repeatedly to check oscillation build-up).
Check the spectral purity:

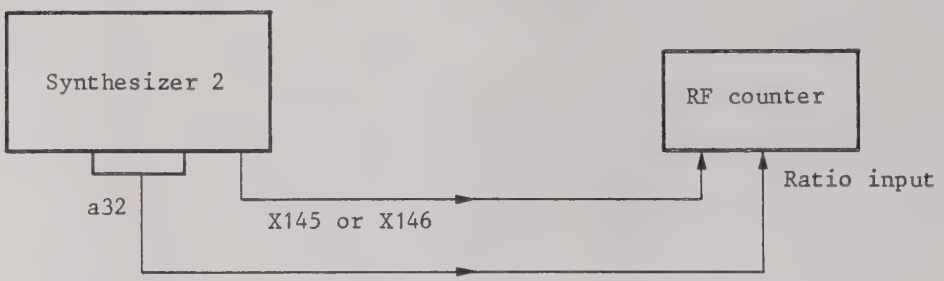
Non-harmonic spurious signals between 0 and 1 GHz: down > 90 dB.

Connect two-port test assembly between X145 and X146. Adjust C901 for maximum decoupling between the two outputs at f = 100 MHz. Decoupling at 100 MHz > 25 dB. Connect frequency counter to X145 or X146. Terminate second output with 50 Ω. Adjust L901 for f = 100.000 MHz ±0.1 kHz. (Switch on and off repeatedly to check oscillation.)

Connect analyzer to X145, X146 and check level:
Useful level at f = 100 MHz: +3 ±2 dBm.

Adjustment of buffer amplifier V54, V55:
Connect oscilloscope with low-capacitance probe to test points P3, P4.
Adjust C902 and C903 for maximum.

Check for proper divisions by ratio counting:



The counter must reproduce the division factor 10 000 exactly. After disconnecting the probe from P3, P4, C903 may have to be trimmed slightly. Check synchronization with an external reference signal. To this end, apply a reference signal of 5 or 10 MHz to X144.

Settability of external frequency: increments of < 100 Hz

Level from 50-Ω source > 1 V.

Check control voltage at P7:

The control voltage must be approximately +5 V and must vary with the reference frequency over ±500 Hz. The control voltage must not contain any periodic AC voltage. Check the spectral purity of the signal in the sideband at X145 or X146.

Accuracy of frequency 30 s after switch-on: $< 1 \times 10^{-5}$.

Adjustment of 110.7-to-210.699-MHz oscillator

Remove links X2 and X4.

Apply DC voltage of +5 ±0.2 V to X1, pin 1.

Apply DC voltage adjustable between +3 and +25 V to X3, pin 1.

Connect frequency counter to X142. Bend T2 so that

f = 110 MHz is obtained with a DC voltage of > +3 V;

f = 211 MHz is obtained with a DC voltage of < +25 V.

The typical coarse tuning voltage/frequency characteristic is shown in Fig. 5

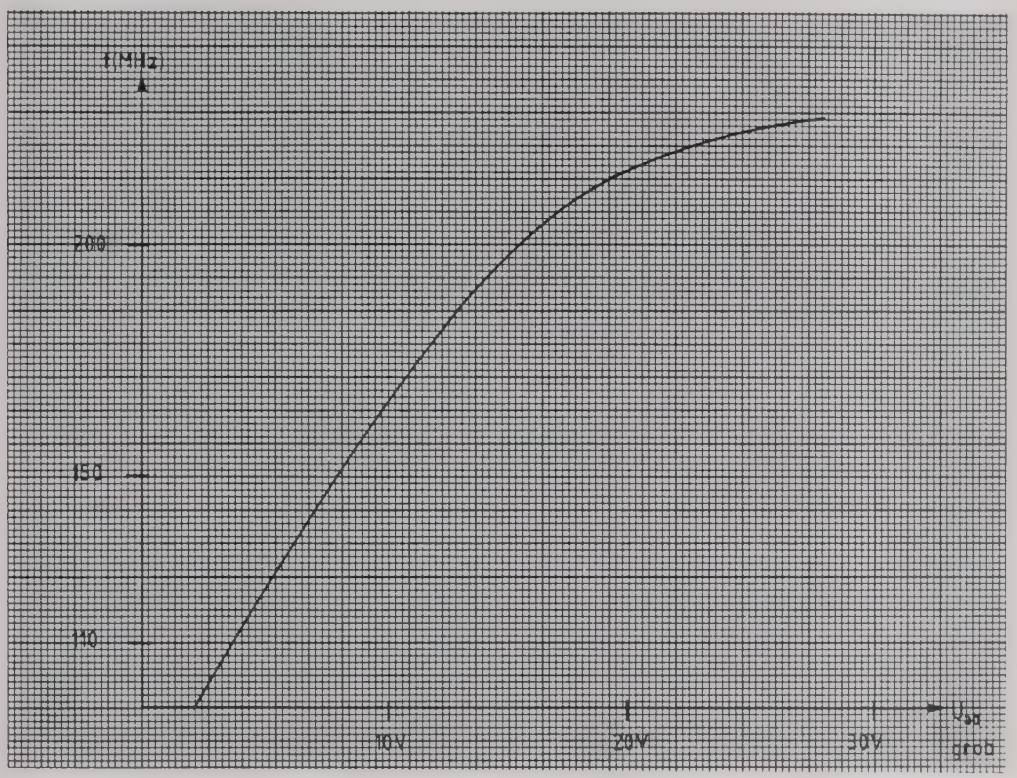


Fig. 5 Typical coarse tuning characteristic of the 110-to-210-MHz oscillator

Checking the fine tuning

Adjust frequency of 110.7 MHz by varying the coarse tuning voltage (X3, pin 1). Vary the fine tuning voltage between +4 and +6 V in 0.5-V steps.

Tuning characteristic: min. 80 kHz/V; max. 180 kHz/V.

Check at 210.7 MHz:

Tuning characteristic: min. 160 kHz/V; max. 240 kHz/V.

The typical fine tuning voltage/frequency characteristic is shown in Fig. 6.

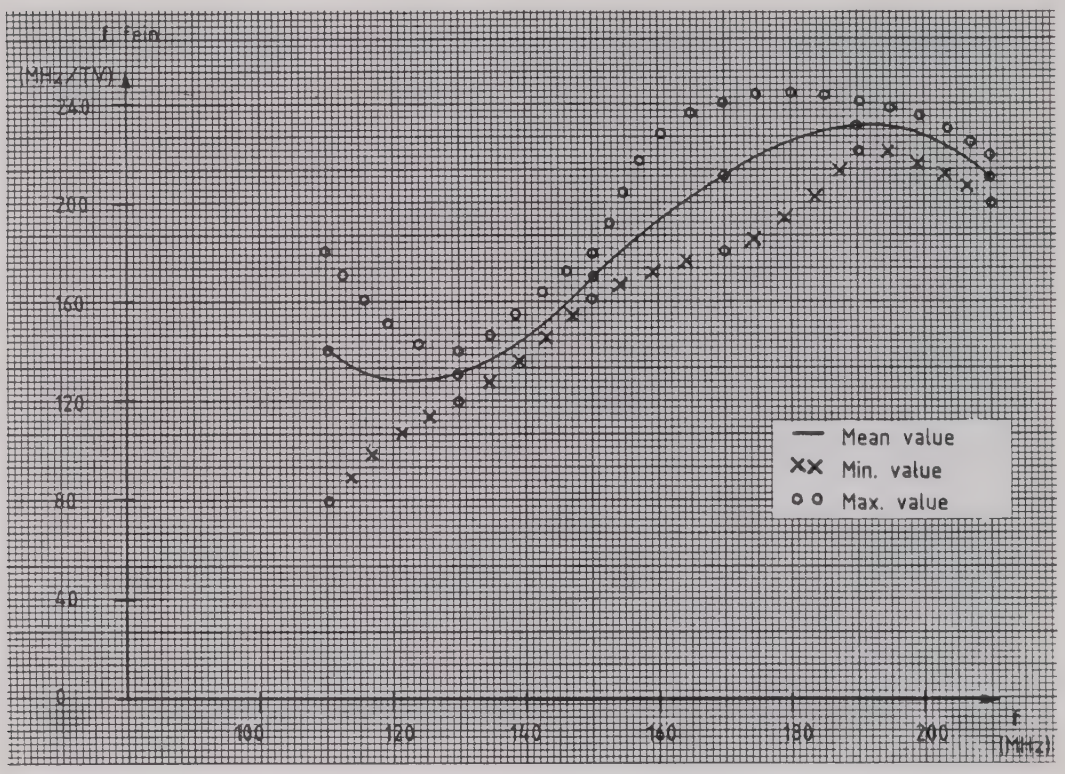


Fig. 6 Typical fine tuning characteristic of the 110-to-210-MHz oscillator

Check the operating points of V11 and V13:
Measure the DC voltage at P1 and P2: +7.3 V ±0.2 V.

Check the RF level at X142 with selective measuring instrument (test receiver, analyzer)
f (110.7 to 210.7 MHz) +4 dBm ±2 dB

Check the ECL dividers (using low-capacitance probe and oscilloscope):
D4: pins 1, 16
D4: pin 9
D4: pin 11
D5: pin 11

If the level at D4, pin 11 is low try interchanging D4 and D5.
Check the complete divider chain:

The frequency from the oscillator V14 is applied to the RF input X142 of the ratio counter.

A frequency corresponding to the five-decade frequency setting (ab11 to a29) plus 11070 (P8/1) or 110700 (P8/2) is applied to the ratio input of the counter via test point P8/1 or P8/2. Check accuracy to within at least ten frequencies between 110.7 and 210.699 MHz.

Check the reference voltage at D10, pin 22:
f = 2.5 MHz, level 10 V CMOS

Check the reference voltage at C10, pin 25, 26 or D6, pin 13:
f = 10 kHz, level 10 V CMOS

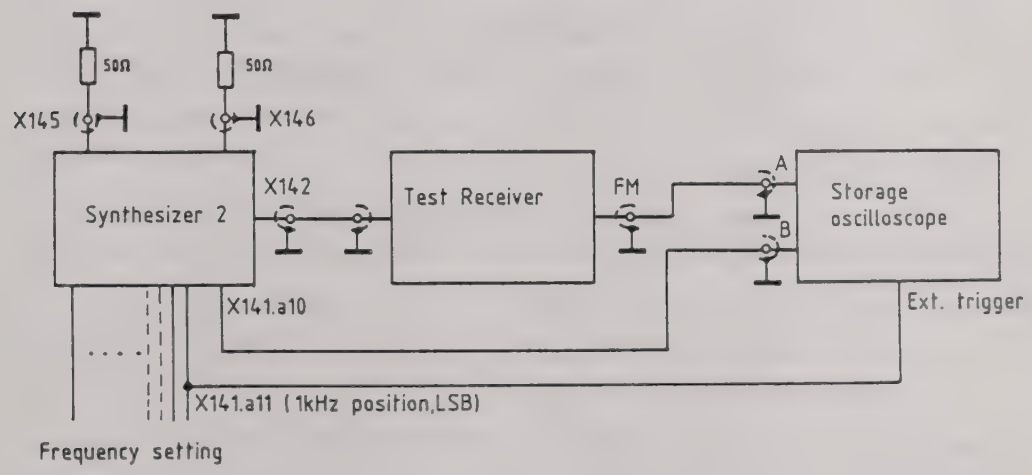
Insert links X2 and X4.

Check synchronization indication at a10:
Synchronized: high = +5 V
Not synchronized: low < 0.5 V.

With synchronization the frequency counter should read out the frequency setting of the five decades plus 110.700.

Adjustment of synchronization and transient response time:

Test setup:



Test receiver setting:	IF bandwidth: (1 V/kHz at FM output)	7.5 kHz
	IF attenuation:	40 dB
	RF attenuation:	30 dB

The following setting times should be obtained (max. deviation from the final frequency < 3 kHz):

Frequency jump (at X142)	Synchronization active (X141.a10 low)	Transient response time of slow PLL
111.001 → 111.02 MHz	-	≤ 20 ms
189.981 → 190.000 MHz	-	≤ 20 ms
210.680 → 210.699 MHz	-	≤ 20 ms
110.999 → 116.300 MHz	typ. 10 ms	≤ 35 ms
210.699 → 110.700 MHz	max. 70 ms	≤ 35 ms

The transient response time of the slow PLL is the time required for the synthesizer to reach the final frequency when the synchronization is no longer active (high).

The transient response time is adjusted by means of R901.

If necessary, C48 (6 pF) can be fine adjusted over the range of 3.9 to 8.2 pF (N150).

Check sideband characteristics of signal at X142. Use selective measuring instrument (with low inherent sideband noise, e.g. analyzer).
Phase noise:

f = 110.7 MHz down > 105 dB/Hz 2.5 kHz from carrier
f = 210.699 MHz down > 100 dB/Hz 2.5 kHz from carrier

Discrete signals:
The following discrete signals may occur:
n x 1 kHz --> phase modulation by the reference
n x 1.25 kHz --> crosstalk of the clock frequency from D6, D1, D2, D3

Level: down > 60 dB at f = 1 kHz
down > 70 dB at f = 2 kHz
down > 90 dB at f > 10 kHz

Check the synchronization time:

The maximum permissible time for frequency switching from the input of the new frequency until synchronization indication is high:
70 ms.

5.3 Troubleshooting

Reference circuit:

a) No level present at X145, X146:
Check operating pulses of
V51, V52, V53: V_{source} to ground +3 V $^{+50\%}_{-30\%}$
Adjust L901.
Check crystal.

b) No 10-kHz reference frequency:
Check divider chain D23, D22, D21,
D20II, D20I, V55, V54.

c) No synchronization with external reference frequency:
Check 100-kHz TTL level at P5 and P6.
Check switchover of control voltage by means of D27.
In the case of inappropriate control of D20 the control frequency may be exactly 100 MHz but due to phase jitter of D20 spurious modulation may be such that slow synchronization is not possible.

110.7-to-210.699-MHz loop

a) Loop does not lock at any frequency entered.
Check reference frequency at P3.
Check divided-down oscillator frequency at P6 and P8/3.
Check divider chain D6, D5, D4.
Check frequency input D6, D3, D2, D1.
Check oscillator, oscillator amplifier stages and the two tuning voltages.

b) Wrong synchronization of the loop in the low-order digits of the frequency:
Check performance of D7, D8, D9.
Check the two ECL dividers D4, D5.

c) Loop unsteady with input frequency > 80 000:
Wrong setting of R901 or R71 too low.
Excessive gain of fine tuning (C48, V1).

d) Wrong division at f = 140 MHz ±10 MHz:
Inappropriate operating point of D4.

e) High spurious deviation despite synchronization:
Check time constant switchover (D14, D11, V41, V42).

f) Spurious:

n x 1 kHz: Check the low-pass filters of the control lines

n x 1.25 kHz: Leakage, crosstalk from the centre card frame.

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
	27	1283	ED SYNTHESIZER 2	342.5003.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
B1	EG 100MHZ5.S.THERM.HC-37U 100MHZ-CRYSTAL,TEMP.STAB AEG-TELEF TG 02 FO=100,000MHZ	343.0034	
C1	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C40			
C41	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C42	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C43	CE 220UF-10+100%16V 13X17 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4227-Z	CE 022.7566	
C44	CC 220NF+-10%50V7K1200VIE CERAMIC CAPACITOR AEROVOX CKR06BX224KL	CC 084.5515	
C45	CC 1,5UF+-20%50VK6000VIEL CAPACITOR ERIE 8737-050-Z5U-1,5	CC 060.0071	
C46	CE 47UF -10+100%16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK47/16	CE 022.7543	
C47	CC 330PF+-2%6X9N750 CERAMIC CAPACITOR VALVO 2222 678 58331	CC 087.6964	
C48	CC 6PF+-0,5PF N150/IB RD5 CERAMIC CAPACITOR DRALORIC N150/IB6/0,5SDPN TRIMMWERT	CC 006.0225	
C49	CC 18PF+-2%3X4NP0 CAPACITOR VALVO 2222 678 10189	CC 087.6458	
C50	CE 22 UF+-20%16V 7X 5X11 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKO ETR3-22/15	CE 022.8091	
C51	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C52	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C53	CC 100PF+-2%6X9NP0 CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C54	CC 680PF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 681	CC 087.7019	
C55	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C56	CC 100PF+-2%6X9NP0	CC 087.6541	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	CAPACITOR		
	VALVO 2222 678 10101		
C57	CE 22 UF+-20%16V 7X 5X11	CE 022.8091	
	ELECTROLYTIC CAPACITOR		
	ERO-TANTAL TA-ELKO ETR3-22/15		
C58	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C59	CC 4,7NF+-10%6X9R2000	CC 087.7102	
	CAPACITOR		
	VALVO 2222 63051 472		
C60	CE 100UF-10+100%16V 11X13	CE 022.7550	
	ELECTROLYTIC CAPACITOR		
	SIEMENS B41316-A4107-Z		
C61	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C62	CC 4,7NF+-10%6X9R2000	CC 087.7102	
	CAPACITOR		
	VALVO 2222 63051 472		
C63	CE 100UF-10+100%16V 11X13	CE 022.7550	
	ELECTROLYTIC CAPACITOR		
	SIEMENS B41316-A4107-Z		
C64	CE 100UF-10+100%16V 11X13	CE 022.7550	
	ELECTROLYTIC CAPACITOR		
	SIEMENS B41316-A4107-Z		
C65	CC 100NF+-10% 50V5K1200LR	CC 092.0777	
	CAPACITOR		
	AEROVOX CKR05BX104KLEVELR		
C66	CC 82PF+-2%6X7NP0	CC 087.6535	
	CAPACITOR		
	VALVO 2222 678 10829		
C67	CC 100NF+-10% 50V5K1200LR	CC 092.0777	
	CAPACITOR		
	AEROVOX CKR05BX104KLEVELR		
C68	CC 100NF+-10% 50V5K1200LR	CC 092.0777	
	CAPACITOR		
	AEROVOX CKR05BX104KLEVELR		
C69	CC 3,9NF+-10%6X8R2000	CC 087.7090	
	CAPACITOR		
	VALVO 2222 63051 392		
C70	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C71	CK 22 NF+-10%160V 14X6X10	CK 006.5333	
	PLASTIC FOIL CAPACITOR		
	ROEDERST KT1807-32202		
C72	CE 100UF-10+100%16V 11X13	CE 022.7550	
	ELECTROLYTIC CAPACITOR		
	SIEMENS B41316-A4107-Z		
C73	CC 1UF +-10% 50VK1200LR	CC 092.1015	
	CAPACITOR		
	AEROVOX CKR06BX105KLEVELR		
C74	CE 100UF-10+100%16V 11X13	CE 022.7550	
	ELECTROLYTIC CAPACITOR		
	SIEMENS B41316-A4107-Z		
C75	CE 100UF-10+100%40V 13X17	CE 022.7595	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	ELECTROLYTIC CAPACITOR SIEMENS B41316-B7107-Z		
C76	CC 33 NF+-10% 50V5K1200LR CAPACITOR AEROVOX CKR05BX333KLEVELR	CC 092.0719	
C77	CC 12 NF+-10% 50V5K1200LR CAPACITOR AEROVOX CKR05BX123KLEVELR	CC 092.0660	
C78	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C79	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C80	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C83			
C84	CC 47 NF+-10% 50V5K1200LR CAPACITOR AEROVOX CKR05BX473KLEVELR	CC 092.0731	
C85	CC 220NF+-10% 50V8K1200LR CAPACITOR AEROVOX CKR06BX224KLEVELR	CC 092.0931	
C86	CC 220NF+-10% 50V8K1200LR CAPACITOR AEROVOX CKR06BX224KLEVELR	CC 092.0931	
C87	CC 100NF+-10% 50V5K1200LR CAPACITOR AEROVOX CKR05BX104KLEVELR	CC 092.0777	
C88	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C89	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C90	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C91	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C92	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C93	CC 1UF+-10%50V7K1200VIEL CAPACITOR AEROVOX CKR06BX105KL	CC 084.5538	
C94	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C95	CE 220UF-10+100%16V 13X17 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4227-Z	CE 022.7566	
C96	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	AEROVOX CKR05BX104KLEVELR		
C97	CC 330PF+-2%6X9N750 CERAMIC CAPACITOR VALVO 2222 678 50331	CC 087.6964	
C99	CC 3,2PF+-0,25PF3X4N750 CAPACITOR VALVO 2222 678 57828	CC 087.6770	
C100	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C101	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C102	CC 8,2PF+-0,25PF3X4N750 CAPACITOR VALVO 2222 678 57828	CC 087.6770	
C103	CC 120PF+-2%6X9NP0 CAPACITOR VALVO 2222 678 10121	CC 087.6558	
C104	CC 56PF+-2%4X5N750 CAPACITOR VALVO 2222 678 58569	CC 087.6870	
C105	CC 12PF+-2%3X4NP0 CAPACITOR VALVO 2222 678 10129	CC 087.6435	
C106	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C107	CC 8,2PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09828	CC 087.6412	
C108	CC 47PF+-2%5X6NP0 CAPACITOR VALVO 2222 678 10479	CC 087.6506	
C109	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0764	
C110	CC 1PF+-0,25PF3X4P100 CAPACITOR VALVO 2222 678 03108	CC 087.6170	
C111	CC 33PF+-2%4X5NP0 CAPACITOR VALVO 2222 678 10339	CC 087.6487	
C113	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C114	CC 2,2PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09228	CC 087.6341	
C115	CC 15PF+-2%3X4NP0 CAPACITOR VALVO 2222 678 10159	CC 087.6441	
C116	CC 63PF+-2%6X7NP0 CAPACITOR VALVO 2222 678 10639	CC 087.6529	
C118	CC 4,7NF+-10%6X9R2000 CAPACITOR	CC 087.7102	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	VALVO 2222 63051 472		
C119	CC 4,7NF+-10%6X9R2000 CAPACITOR	CC 087.7102	
	VALVO 2222 63051 472		
C120	CC 4,7NF+-10%6X9R2000 CAPACITOR	CC 087.7102	
	VALVO 2222 63051 472		
C121	CC 33PF+-2%4X5NP0 CAPACITOR	CC 087.6487	
	VALVO 2222 678 10339		
C123	CC 4,7NF+-10%6X9R2000 CAPACITOR	CC 087.7102	
	VALVO 2222 63051 472		
C124	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
	AEROVOX CKR06BX104KL		
C126	CC 220NF+-10% 50V8K1200LR CAPACITOR	CC 092.0931	
	AEROVOX CKR06BX224KLEVELR		
C127	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR	CE 022.7550	
	SIEMENS B41316-A4107-Z		
C128	CC 1UF +-10% 50VK1200LR CAPACITOR	CC 092.1015	
	AEROVOX CKR06BX105KLEVELR		
C129	CC 100PF+-2%4X5N750 CAPACITOR	CC 087.6906	
	VALVO 2222 678 58101		
C130	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	
	AEROVOX CKR05BX104KLEVELR		
C131	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	
	AEROVOX CKR05BX104KLEVELR		
C132	CC 10NF-20+50%7X8R6000 CAPACITOR	CC 087.7525	
	VALVO 2222 63051 64051103		
BIS/TO C135			
C136	CC 10NF-20+50%7X8R6000 CAPACITOR	CC 087.7525	
	VALVO 2222 63051 64051103		
C137	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR	CE 022.7550	
	SIEMENS B41316-A4107-Z		
C142	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR	CE 022.7550	
	SIEMENS B41316-A4107-Z		
C143	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
	AEROVOX CKR06BX104KL		
C144	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR	CE 022.7550	
	SIEMENS B41316-A4107-Z		
C145	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR	CE 022.7550	
	SIEMENS B41316-A4107-Z		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C146	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C149			
C150	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C151	CC 27PF+-2%4X5NP0 CAPACITOR VALVO 2222 678 10279	CC 087.6470	
C152	CC 27PF+-10%100V3NP0 CHIP CAPACITOR VITRAMON VJ1005A270KFB	CC 082.3038	
C153	CC 27PF+-2%4X5NP0 CAPACITOR VALVO 2222 678 10279	CC 087.6470	
C154	CC 27PF+-10%100V3NP0 CHIP CAPACITOR VITRAMON VJ1005A270KFB	CC 082.3038	
C240	CE 47UF -10+100%16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK47/16	CE 022.7543	
C901	CT 15,5PF N750 ABGL OBEN DISC TRIMMER STETTNER 7-STRIKO 03/4,5/20N7	CT 065.9677	
C902	CT 15,5PF N750 ABGL OBEN DISC TRIMMER STETTNER 7-STRIKO 03/4,5/20N7	CT 065.9677	
C903	CT 15,5PF N750 ABGL OBEN DISC TRIMMER STETTNER 7-STRIKO 03/4,5/20N7	CT 065.9677	
D1	BL CD4097BF 2XANAL. MUX MULTIPLEXER RCA CD4097BF	BL 343.0040	
D2	BL CD4097BF 2XANAL. MUX MULTIPLEXER RCA CD4097BF	BL 343.0040	
D3	BL HEF4104BP 4X CONVERT CONVERTER VALVO HEF4104BP	BL 252.7395	
D4	BL SP8695BDG10:1DIVID UHF DIVIDER PLESSEY SP8695BDG	BL 303.8970	
D5	BL SP8695BDG10:1DIVID UHF DIVIDER PLESSEY SP8695BDG	BL 303.8970	
D6	BL HEF4751VD UNIV. DIVID UNIVERSAL DIVIDER VALVO HEF4751VD	343.0057	
D7	BL SN74LS02N 4/2INP.NOR IC NOR GATE SN74LS02N TEXAS SN74LS02N	BL 266.4658	
D8	BL SN74LS20N 2/4INP.NAND IC NAND GATE SN74LS20N TEXAS SN74LS20N	BL 266.2055	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D9	BL SN74LS192N ZAEHLER IC COUNTER SN74LS192N TEXAS SN74LS192N	BL 235.8300	
D10	BL HEF4750VD FREQU.SYNTH FREQUENCY SYNTHESIZER VALVO HEF4750VD	343.0063	
D11	BJ TL604CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL604CP	BJ 300.6199	
D12	BJ TL604CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL604CP	BJ 300.6199	
D13	BL CD4011BF 4X2IN.NANDG NAND GATE RCA CD4011BF	BL 517.7572	
D14	BO ICM7555IPA CMOS-TIMER DO ICM7555IPA CMOS-TIMER INTERSIL ICM75555IPA	BO 303.9260	
D20	BL SN74S112N-S1 2/JK-FLIP IC FLIP-FLOP SN74S112N TEXAS SN74S112N-S1	BL 102.8045	
D21	BL SN74LS290N DEC.COUNTER IC DECADE COUNTER SN74LS2 TEXAS SN74LS290N	BL 300.6447	
D22	BL SN74LS290N DEC.COUNTER IC DECADE COUNTER SN74LS2 TEXAS SN74LS290N	BL 300.6447	
D23	BL MC14522BAL BCD COUNT COUNTER MOTOROLA MC14522BAL	BL 418.0187	
D24	BL MC14510BAL BCD COUNT COUNTER RCA CD4510BF	BL 418.0229	
D26	BL CD4046BF PHASE-L-L PHASE LOCKED LOOP RCA CD4046BF	BL 530.6060	
D27	BJ TL604CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL604CP	BJ 300.6199	
D28	BL SN74LS290N DEC.COUNTER IC DECADE COUNTER SN74LS2 TEXAS SN74LS290N	BL 300.6447	
D29	BL MC14522BAL BCD COUNT COUNTER MOTOROLA MC14522BAL	BL 418.0187	
L1	LD 4,70UH10%1,200HM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L2	LD 120 UH10%13,00HM0,066A CHOKE DELEVAN DROSSEL1025-70	LD 067.3118	
L3	LF ROHRKERN RD3,5XRD1,2XL TUBLAR CORE VALVO 431202031051	LF 026.9257	
L4	LD 1,00UH10%1,00OHM0,390A CHOKE	LD 067.2863	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DELEVAN 1025-20		
L5	LF ROHRKERN RD3,5XRD1,2XL TUBLAR CORE VALVO 431202031051	LF 026.9257	
L6	LD 1,00UH10%1,000HM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L7	LD 1,00UH10%1,000HM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L8	LF ROHRKERN RD3,5XRD1,2XL TUBLAR CORE VALVO 431202031051	LF 026.9257	
L9	ROHRKERN-SPULE	342.5061	
L11	LD 4,70UH10%1,200HM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L12	LD 4,70UH10%1,200HM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L13	LD 47,0UH10%4,500HM0,110A CHOKE DELEVAN DROSSEL1025-60	LD 067.3060	
L14	LD 47,0UH10%4,500HM0,110A CHOKE DELEVAN DROSSEL1025-60	LD 067.3060	
L15	LD 47,0UH10%4,500HM0,110A CHOKE DELEVAN DROSSEL1025-60	LD 067.3060	
L16	LD 4,70UH10%1,200HM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L17	LD 4,70UH10%1,200HM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L18	LD 4,70UH10%1,200HM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L29	SPULE	342.5090	
L30	SPULE	342.5090	
L40	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L50	LD 0,47UH10%0,350HM0,660A CHOKE DELEVAN DROSSEL1025-12	LD 067.2828	
L51	LD 0,47UH10%0,350HM0,660A CHOKE DELEVAN DROSSEL1025-12	LD 067.2828	
L52	LD 4,70UH10%1,200HM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L53	LD 0,22UH10%0,140HM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L54	LD 0,15UH10%0,100HM1,230A CHOKE	LD 067.2763	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DELEVAN DROSSEL1025-00		
L55	LD 0,12UH10%0,090HM1,300A	LD 067.2757	
	CHOKE		
	DELEVAN DROSSEL1025-96		
L56	LD 0,15UH10%0,100HM1,230A	LD 067.2763	
	CHOKE		
	DELEVAN DROSSEL1025-00		
L57	LD 0,18UH10%0,120HM1,120A	LD 067.2770	
	CHOKE		
	DELEVAN DROSSEL1025-02		
L58	LD 0,18UH10%0,120HM1,120A	LD 067.2770	
	CHOKE		
	DELEVAN DROSSEL1025-02		
L59	LF ROHRKERN RD3,5XRD1,2XL	LF 026.9257	
	TUBLAR CORE		
	VALVO 431202031051		
L60	LD 1,00UH10%1,000HM0,390A	LD 067.2863	
	CHOKE		
	DELEVAN 1025-20		
L62	LD 47,0UH10%4,500HM0,110A	LD 067.3060	
	CHOKE		
	DELEVAN DROSSEL1025-60		
L63	LD 4,70UH10%1,200HM0,239A	LD 067.2940	
	CHOKE		
	DELEVAN DROSSEL1025-36		
L64	LD 4,70UH10%1,200HM0,239A	LD 067.2940	
	CHOKE		
	DELEVAN DROSSEL1025-36		
L65	LD 10,0UH10%3,300HM0,144A	LD 026.4184	
	CHOKE		
	DELEVAN DROSSEL1025-44		
L66	LD 4,70UH10%1,200HM0,239A	LD 067.2940	
	CHOKE		
	DELEVAN DROSSEL1025-36		
BIS/TO L71			
L74	LD 0,10UH10%0,080HM1,400A	LD 067.2740	
	CHOKE		
	DELEVAN DROSSEL1025-94		
L75	LD 0,10UH10%0,080HM1,400A	LD 067.2740	
	CHOKE		
	DELEVAN DROSSEL1025-94		
L901	LD 0,114UH/22PF Q150+KERN	343.0328	
	COIL+CORE		
	TOCO 301-SS-0300		
N1	BO LF355N BIFET.OP-AMP.	BO 092.8161	
	IC OPERATION AMPLIFIER LF		
	NSC LF355N		
N2	BO NE5534AH OP-AMP.	296.8451	
	OPERATION AMPLIFIER		
	VALVO TDA1034N		
N3	BO LF355N BIFET.OP-AMP.	BO 092.8161	
	IC OPERATION AMPLIFIER LF		
	NSC LF355N		
P1	VL WIRE-WRAP PIN	VL 088.4542	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	BERG NR. 75 403-003		
P2	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		
BIS/TO P7			
P8	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		
	3 POLE		
P9	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		
R1	RL 0,35W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R2	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
BIS/TO R20			
R21	RL 0,35W 100 OHM+-1%TK50	RL 082.6543	
	DEPOS.-CARBON RESISTOR		
	DRALORIC SMA0207/100/HM-F-D		
R22	RL 0,35W 100 OHM+-1%TK50	RL 082.6543	
	DEPOS.-CARBON RESISTOR		
	DRALORIC SMA0207/100/HM-F-D		
R23	RL 0,35W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R24	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R25	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R26	RL 0,35W 56,2KOHM+-1%TK50	RL 082.2231	
	RESISTOR		
	DRALORIC SMA0207/56,2K-F-C		
R27	RL 0,35W 27,4KOHM+-1%TK50	RL 082.2583	
	RESISTOR		
	DRALORIC SMA 0207/27,4K-F-C		
R28	RL 0,35W 274 OHM+-1%TK50	RL 083.0178	
	RESISTOR		
	DRALORIC SMA0207/2740HM-F-D		
R29	RL 0,35W 68,1 OHM+-1%TK50	RL 082.9636	
	RESISTOR		
	DRALORIC SMA0207/68,10HM-F-D		
R30	RL 0,35W 33,2 OHM+-1%TK50	RL 082.9359	
	RESISTOR		
	DRALORIC SMA0207/33,20HM-F-D		
R31	RL 0,35W 100 OHM+-1%TK50	RL 082.6543	
	DEPOS.-CARBON RESISTOR		
	DRALORIC SMA0207/100/HM-F-D		
R32	RL 0,35W 274 OHM+-1%TK50	RL 083.0178	
	RESISTOR		
	DRALORIC SMA0207/2740HM-F-D		
R33	RL 0,35W 825 OHM+-1%TK50	RL 082.2502	
	RESISTOR		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DRALORIC SMA 0207/3250HM-F-C		
R34	RL 0,35W 274 OHM+-1%TK50	RL 083.0178	
	RESISTOR		
	DRALORIC SMA0207/2740HM-F-D		
R35	RL 0,35W 68,1 OHM+-1%TK50	RL 082.9636	
	RESISTOR		
	DRALORIC SMA0207/68,10HM-F-D		
R36	RL 0,35W 56,2KOHM+-1%TK50	RL 082.2231	
	RESISTOR		
	DRALORIC SMA0207/56,2K-F-C		
R37	RL 0,35W 27,4KOHM+-1%TK50	RL 082.2583	
	RESISTOR		
	DRALORIC SMA 0207/27,4K-F-C		
R38	RL 0,35W 274 OHM+-1%TK50	RL 083.0178	
	RESISTOR		
	DRALORIC SMA0207/2740HM-F-D		
R39	RL 0,35W18,20 OHM+-1%TK50	RL 082.9107	
	RESISTOR		
	DRALORIC SMA0207/18,20HM-F-D		
	TRIMMWERT		
R40	RL 0,35W 100 OHM+-1%TK50	RL 082.6543	
	DEPOS.-CARBON RESISTOR		
	DRALORIC SMA0207/100/HM-F-D		
R41	RL 0,35W 681 OHM+-1%TK50	RL 083.0490	
	RESISTOR		
	DRALORIC SMA0207/6810HM-F-D		
R42	RL 0,35W 3,92KOHM+-1%TK50	RL 083.1039	
	RESISTOR		
R43	RL 0,35W 562 OHM+-1%TK50	RL 083.0461	
	RESISTOR		
	DRALORIC SMA0207/5620HM-F-D		
R44	RL 0,25W 1,21KOHM+-1%TK50	RL 083.0655	
	RESISTOR		
	DRALORIC SMA0207/1,21K-F-D		
R45	RL 0,25W 357 OHM+-1%TK50	RL 083.0284	
	RESISTOR		
	DRALORIC SMA0207/3570HM-F-D		
R46	RL 0,35W 475 OHM+-1%TK50	RL 083.0390	
	RESISTOR		
	DRALORIC SMA0207/4750HM-F-D		
R47	RL 0,35W 681 OHM+-1%TK50	RL 083.0490	
	RESISTOR		
	DRALORIC SMA0207/6810HM-F-D		
R48	RL 0,35W 3,92KOHM+-1%TK50	RL 083.1039	
	RESISTOR		
R49	RL 0,25W 357 OHM+-1%TK50	RL 083.0284	
	RESISTOR		
	DRALORIC SMA0207/3570HM-F-D		
R50	RL 0,1W 4990HM+-1%TK50	RL 086.2336	
	RESISTOR		
	DALE MF1/10 499 OHM1%TK50		
R51	RL 0,1W 4990HM+-1%TK50	RL 086.2336	
	RESISTOR		
	DALE MF1/10 499 OHM1%TK50		
R52	RL 0,25W 357 OHM+-1%TK50	RL 083.0284	
	RESISTOR		
	DRALORIC SMA0207/3570HM-F-D		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R53	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	
R54	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R55	RL 0,35W 82,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/82,5K-F-C	RL 082.2302	
BIS/TO R60			
R61	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R62	RL 0,35W 82,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/82,5K-F-C	RL 082.2302	
R63	RL 0,35W 82,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/82,5K-F-C	RL 082.2302	
R64	RL 0,35W 68,1KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/68,1K-F-C	RL 082.2602	
R66	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R67	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R68	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R69	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	
R70	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R71	RL 0,35W 562 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/562K-F-C TRIMMWERT	RL 083.2664	
R72	RL 0,35W 750 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/750K-F-C	RL 083.2770	
R73	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R74	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R75	RL 0,25W 1,21KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,21K-F-D TRIMMWERT	RL 083.0655	
R76	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR	RL 082.6543	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DRALORIC SMA0207/100/HM-F-D		
R77	RL 0,35W 13,0KOHM+-1%TK50	RL 083.1368	
	RESISTOR		
	DRALORIC SMA0207/13,0K-F-D		
R78	RL 0,35W 6,19KOHM+-1%TK50	RL 082.2283	
	RESISTOR		
	DRALORIC SMA0207/6,19K-F-C		
R79	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R80	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R81	RL 0,35W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
R82	RL 0,21W 10,0 OHM+-1%TK50	RL 092.1715	
	RESISTOR		
	RESISTA MK1 10,00HM 1% TK50		
R83	RL 0,35W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R84	RL 0,25W 47,5KOHM+-1%TK50	RL 083.1800	
	RESISTOR		
	DRALORIC SMA/207/47,5K-F-C		
R85	RL 0,25W 47,5KOHM+-1%TK50	RL 083.1800	
	RESISTOR		
	DRALORIC SMA/207/47,5K-F-C		
R86	RL 0,35W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
BIS/TO R88			
R89	RL 0,35W 1MOHM+-1%TK50	RL 082.7862	
	RESISTOR		
	DRALORIC SMA0207/1M-F-D		
R90	RL 0,1W 4990HM+-1%TK50	RL 086.2336	
	RESISTOR		
	DALE MF1/10 499 OHM1%TK50		
R91	RL 0,35W 4,75KOHM+-1%TK50	RL 083.1097	
	RESISTOR		
	DRALORIC SMA0207/4,75K-F-D		
R92	RL 0,35W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
R93	RL 0,35W 2,21KOHM+-1%TK50	RL 082.2477	
	RESISTOR		
	DRALORIC SMA 0207/2,21K-F-C		
R94	RL 0,25W 47,5KOHM+-1%TK50	RL 083.1800	
	RESISTOR		
	DRALORIC SMA/207/47,5K-F-C		
R95	RL 0,25W 47,5KOHM+-1%TK50	RL 083.1800	
	RESISTOR		
	DRALORIC SMA/207/47,5K-F-C		
R96	RL 0,35W 475 KOHM+-1%TK50	RL 083.2593	
	RESISTOR		
	DRALORIC SMA/207/475K-F-C		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R97	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R98	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R99	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R100	RL 0,35W 150 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/150K-F-C	RL 083.2129	
R101	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R102	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R103	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	
R104	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R105	RL 0,35W 150 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/150K-F-C	RL 083.2129	
R106	RL 0,25W 1,21KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,21K-F-D	RL 083.0655	
R107	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R108	RL 0,35W 132 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/132K-F-C	RL 083.2193	
R109	RL 0,35W 182 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/182K-F-C	RL 083.2193	
R110	RL 0,35W 274 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/274OHM-F-D	RL 083.0178	
R111	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R112	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R113	RL 0,35W 8,25KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/8,25K-F-D	RL 083.1239	
R114	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R115	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R116	RL 0,35W 392 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/392K-F-C	RL 082.2183	
R117	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R118	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R119	RL 0,35W 82,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/82,5K-F-C	RL 082.2302	
R120	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R121	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R122	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R123	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R124	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R125	RL 0,35W 267 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/2670HM-F-D TRIMMWERT	RL 083.0161	
R131	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R133	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R134	RL 0,35W 3,92KOHM+-1%TK50 RESISTOR	RL 083.1039	
R135	RL 0,35W 12,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,1K-F-D	RL 083.1351	
R137	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R138	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R139	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R140	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R141	RL 0,35W 182 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1820HM-F-D	RL 083.0010	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R142	RL 0,35W 182 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1820HM-F-D	RL 083.0010	
R150	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R901	RS 0,5W50KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-503	RS 247.7910	
T1	UEBERTRAGER TRANSFORMER	303.9499	
T2	UEBERTRAGER TRANSFORMER	342.5049	
T3	UEBERTRAGER TRANSFORMER	303.9499	
T4	UEBERTRAGER TRANSFORMER	303.9499	
V1	AE BB209 21/ 3PF CDI TUNING DIODE SIEMENS BB209	AE 475.1708	
V2	AE BB209 21/ 3PF CDI TUNING DIODE SIEMENS BB209	AE 475.1708	342.5049
V3	AE BB209 21/ 3PF CDI TUNING DIODE SIEMENS BB209	AE 475.1708	342.5049
V4	AE BB209 21/ 3PF CDI TUNING DIODE SIEMENS BB209	AE 475.1708	342.5049
V5	AE BB209 21/ 3PF CDI TUNING DIODE SIEMENS BB209	AE 475.1708	342.5049
V6	AE BB209 21/ 3PF CDI TUNING DIODE SIEMENS BB209	AE 475.1708	342.5049
V7	AE BB209 21/ 3PF CDI TUNING DIODE SIEMENS BB209	AE 475.1708	342.5049
V8	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V10	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V11	AK BFR90 NPN 15V 5GHZ TRANSISTOR VALVO BFR90	AK 236.9139	
V12	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V13	AK BFR90 NPN 15V 5GHZ TRANSISTOR VALVO BFR90	AK 236.9139	
V14	AK 2N4356A NKAN 40V FET FET	AD 262.4082	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	TEXAS 2N4856A		
V15	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V16	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V17	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V18	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
BIS/TO V27			
V28	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V29	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V30	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V31	AK BFY90 NPN 15V 25MA TRANSISTOR VALVO BFY90	AK 010.4550	
V32	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
BIS/TO V40			
V41	AK 2N2222A NPN 40V 300MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V42	AM 2N4856A NKAN 40V FET FET TEXAS 2N4856A	AM 262.4082	
V50	AE BB105B 17/ 2PF CDI TUNING DIODE VALVO BB105B	AE 012.6167	
V51	AM BF247A NKAN 25V FET FET TEXAS BF247A	AM 247.6536	
V52	AM U310 NKAN 25V FET FET SILICONIX U310	AM 454.6217	
V53	AM BF247A NKAN 25V FET FET TEXAS BF247A	AM 247.6536	
V54	AM 3N204 N-DUAL-G.MOSF MOS-FET RCA 3N204	AM 204.1910	
V55	AK BFY90 NPN 15V 25MA TRANSISTOR VALVO BFY90	AK 010.4550	
V56	AD 1N4531 75V 0,15A UDI	AD 082.6514	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DIODE		
	UNITRODE 1N4531		
V57	AD 1N4531 75V 0,15A UDI	AD 082.6514	
	DIODE		
	UNITRODE 1N4531		
V58	AK 2N2222A NPN 40V 300MA	AK 010.5405	
	TRANSISTOR		
	VALVO 2N2222A		
X2	FP KURZSCHLUSSBUCHSE	FP 491.7042	
	SHORTING PLUG		
	BERG 65474-004		
X4	FP KURZSCHLUSSBUCHSE	FP 491.7042	
	SHORTING PLUG		
	BERG 65474-004		
X20	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		
X21	FP KURZSCHLUSSBUCHSE	FP 491.7042	
	SHORTING PLUG		
	BERG 65474-004		
X22	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		
X23	FP KURZSCHLUSSBUCHSE	FP 491.7042	
	SHORTING PLUG		
	BERG 65474-004		
X24	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		
X25	FP KURZSCHLUSSBUCHSE	FP 491.7042	
	SHORTING PLUG		
	BERG 65474-004		
X141	FP STECKERL.INDIR.64POLIG	FP 084.6470	
	64-PIN INSERT		
	ERNI STV-P-264 9722.333.		
X142	FJ EINBAUWINKELST. SMC	FJ 249.9684	
	ANGLE CONNECTOR		
	RADIALL R 112 669		
X144	FJ EINBAUWINKELST. SMC	FJ 249.9684	
	ANGLE CONNECTOR		
	RADIALL R 112 669		
X145	FJ EINBAUWINKELST. SMC	FJ 249.9684	
	ANGLE CONNECTOR		
	RADIALL R 112 669		
X146	FJ EINBAUWINKELST. SMC	FJ 249.9684	
	ANGLE CONNECTOR		
	RADIALL R 112 669		
X1/A	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		
X1/B	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		
X3/A	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		
X3/B	VL WIRE-WRAP PIN	VL 088.4542	
	BERG NR. 75 403-003		

- ENDE -

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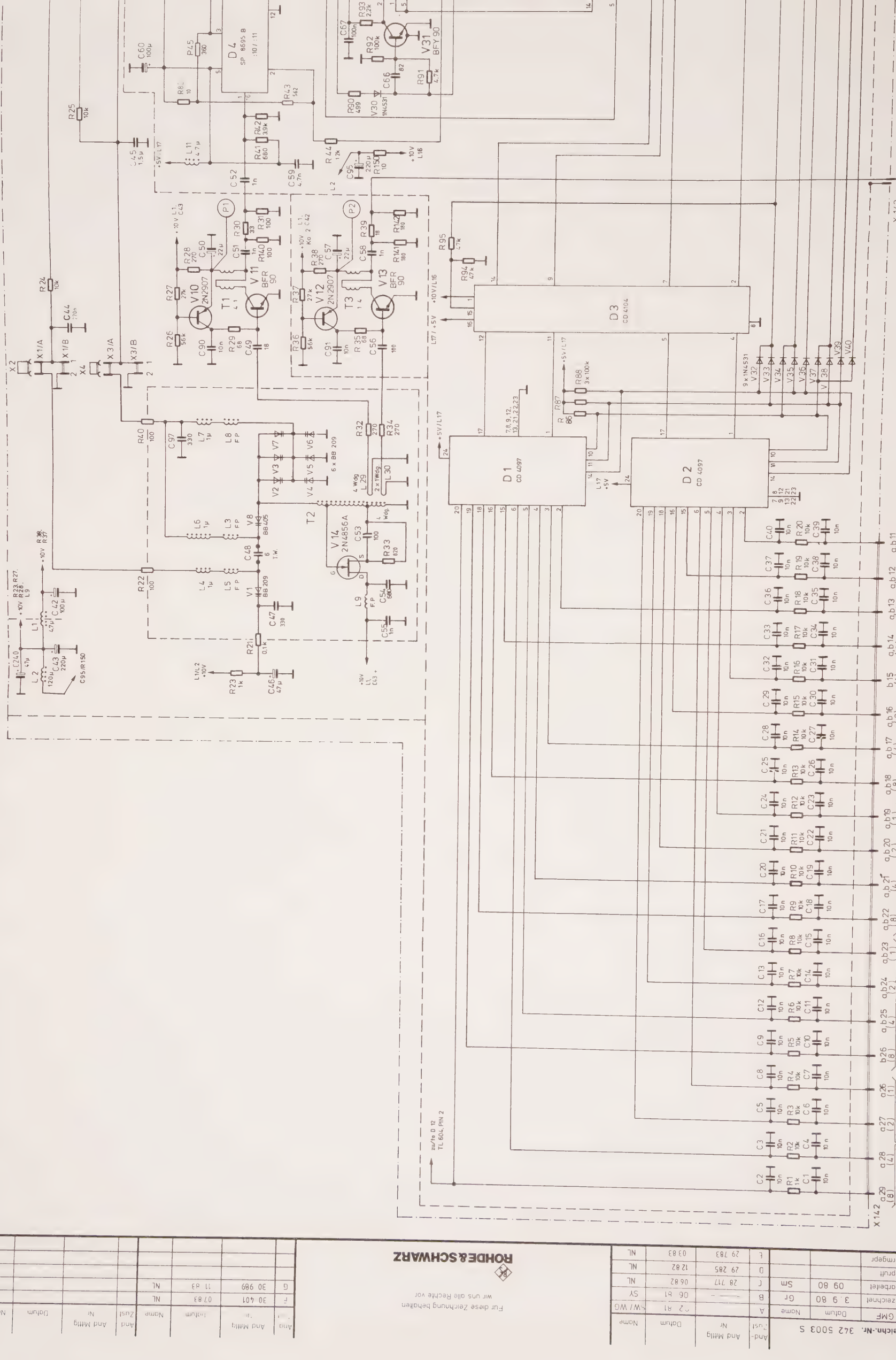

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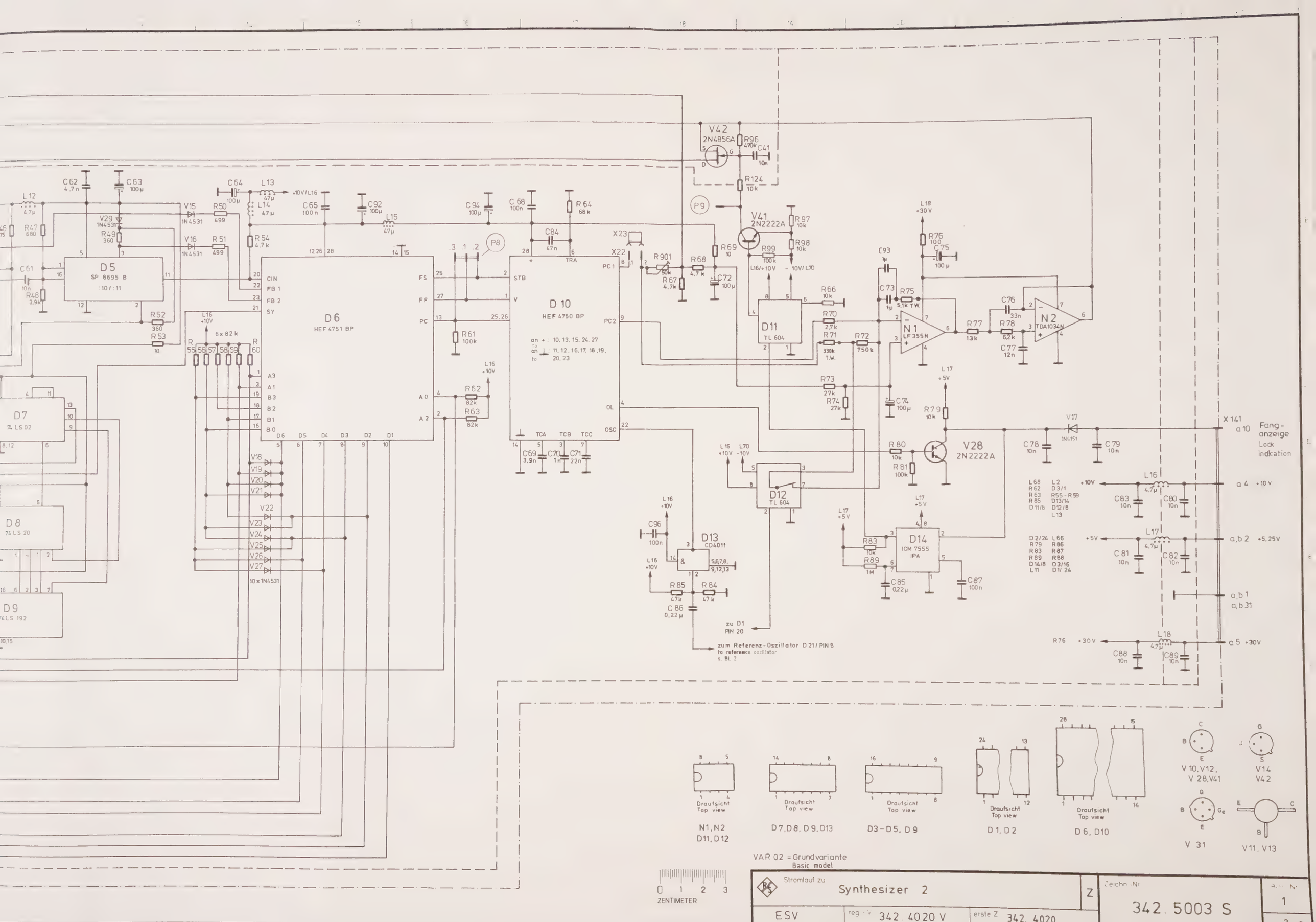
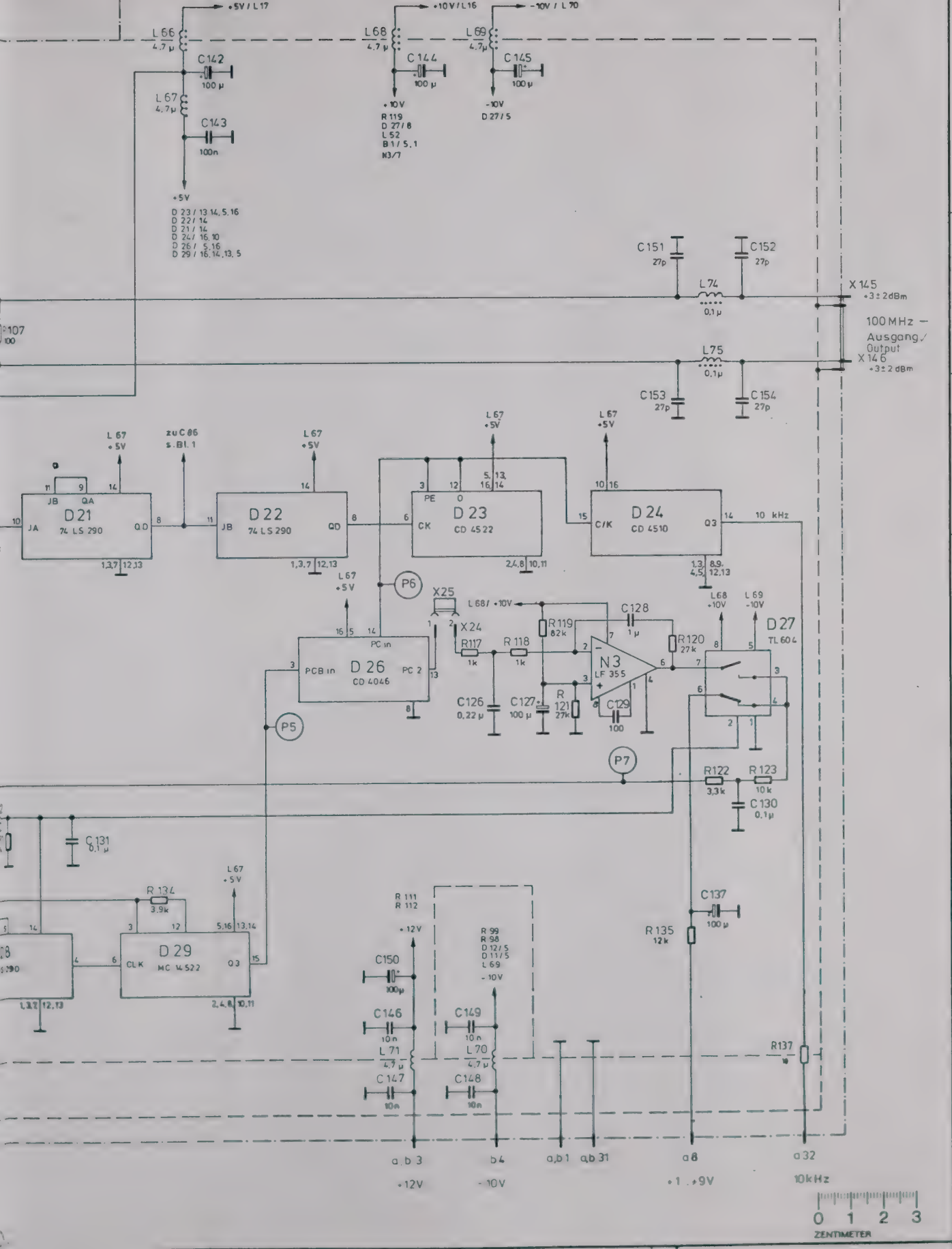
ROHDE & SCHWARZ

Zeichn.-Nr. 342 5003 S						
1 GMF	Datum	Name				
gezeichnet	3.9.80	GF				
bearbeitet	09.80	SM				
geprüft						
normgepr.						

Änd.-Zust.	Änd Mittlg Nr.	Datum	Name
A			
B			
C	28 717	06.82	NL
D	29 285	12.82	NL
E	29 783	03.83	NL

Änd.-Zust.	Änd Mittlg Nr.	Datum	Name
F	30 401	07.83	NL
G	30 989	11.83	NL


D5 SP 8695 B :10/:11
D6 HEF 4751 BP
D7 74 LS 02
D8 74 LS 20
D9 74 LS 192
D10 HEF 4750 BP
D11 TL 604
D12 TL 604
D13 CD4011
D14 ICM 7555 IPA
N1 LF 355 N
N2 TDA 1034 N
V28 2N2222A
V41 2N2222A
V42 2N4856A
10 x 1N4531
6 x 82 k
zu D1 PIN 20
zum Referenz-Oszillator D 21/PIN 8
to reference oscillator
s. Bl. 2
Fang-anzeige
Lock indikation
VAR 02 = Grundvariante
Basic model
Stromlauf zu
Synthesizer 2
Z
ESV
reg.-V 342.4020 V
erste Z 342.4020
Zeichn.-Nr
342.5003 S
Bl.-Nr.
1
v 2 B
ZENTIMETER
Draufsicht
Top view
N1, N2
D11, D12
D7, D8, D9, D13
D3–D5, D9
D1, D2
D6, D10
V 10, V12, V 28, V41
V14
V42
V 31
V11, V13

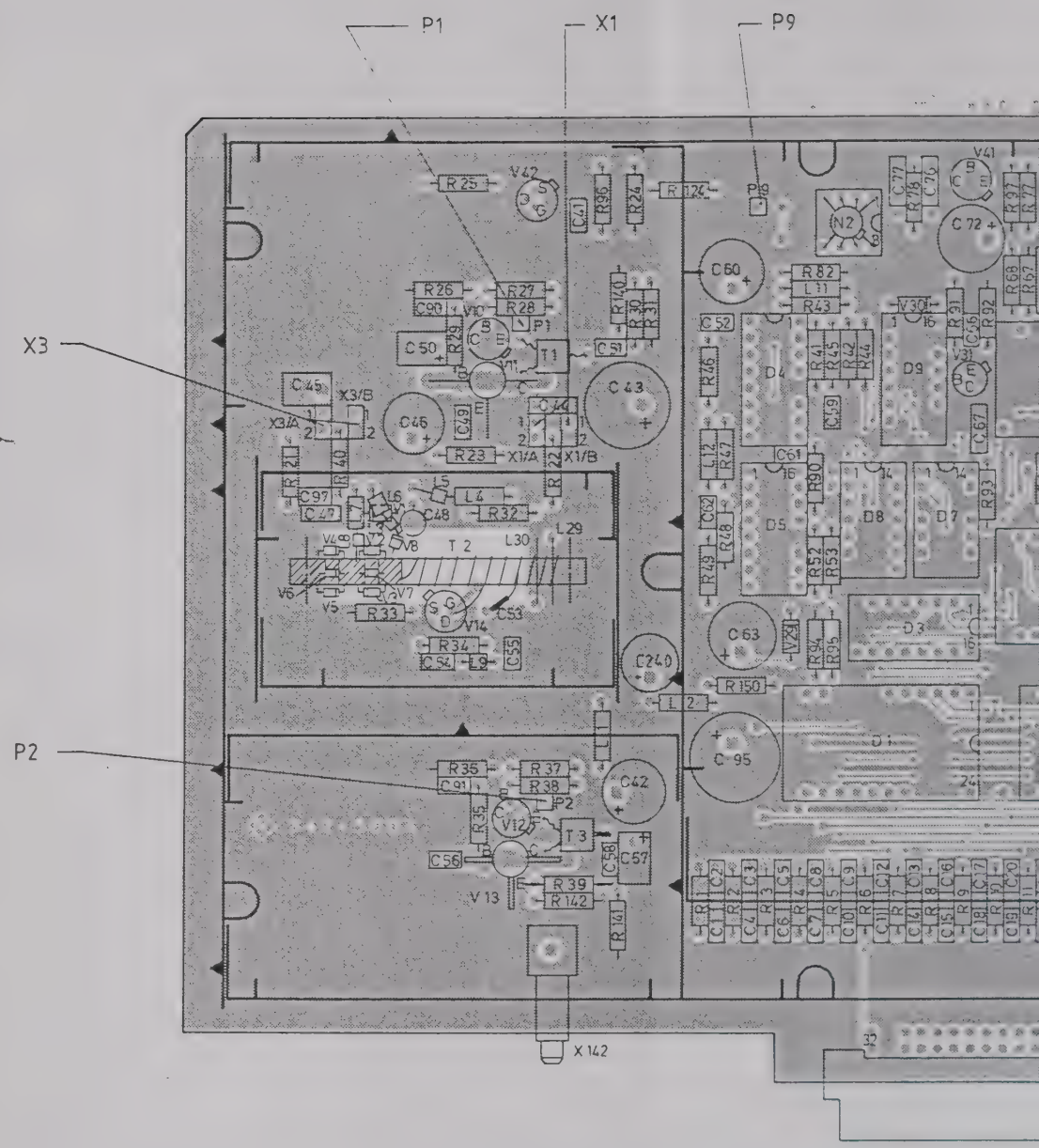


Stromlauf zu

Synthesizer 2

Z

Zeichn. Nr. 342 5003 S Bl. 2



Ansicht und Leitungsführung Bauteilseite
View of tracks on component side

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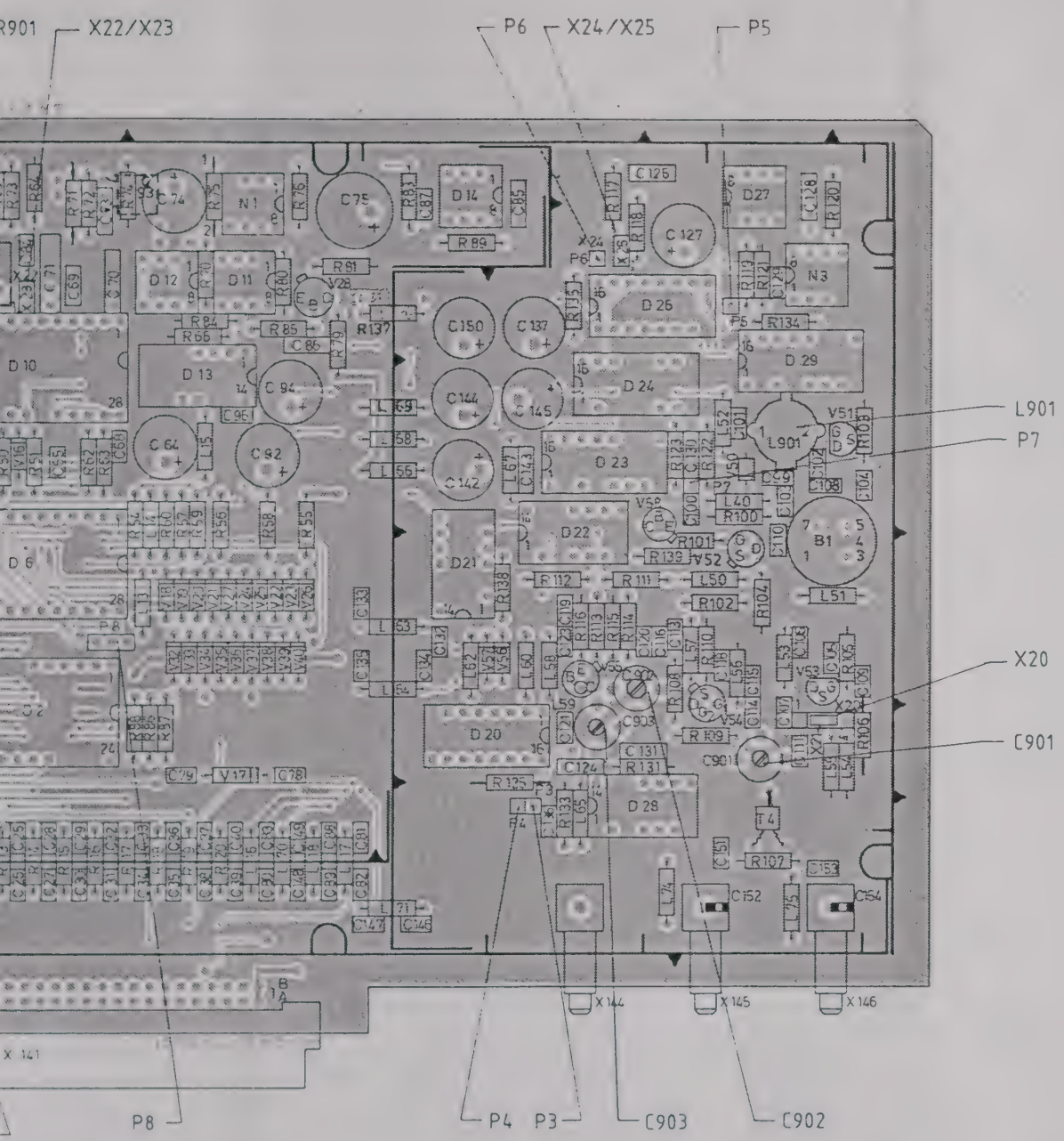
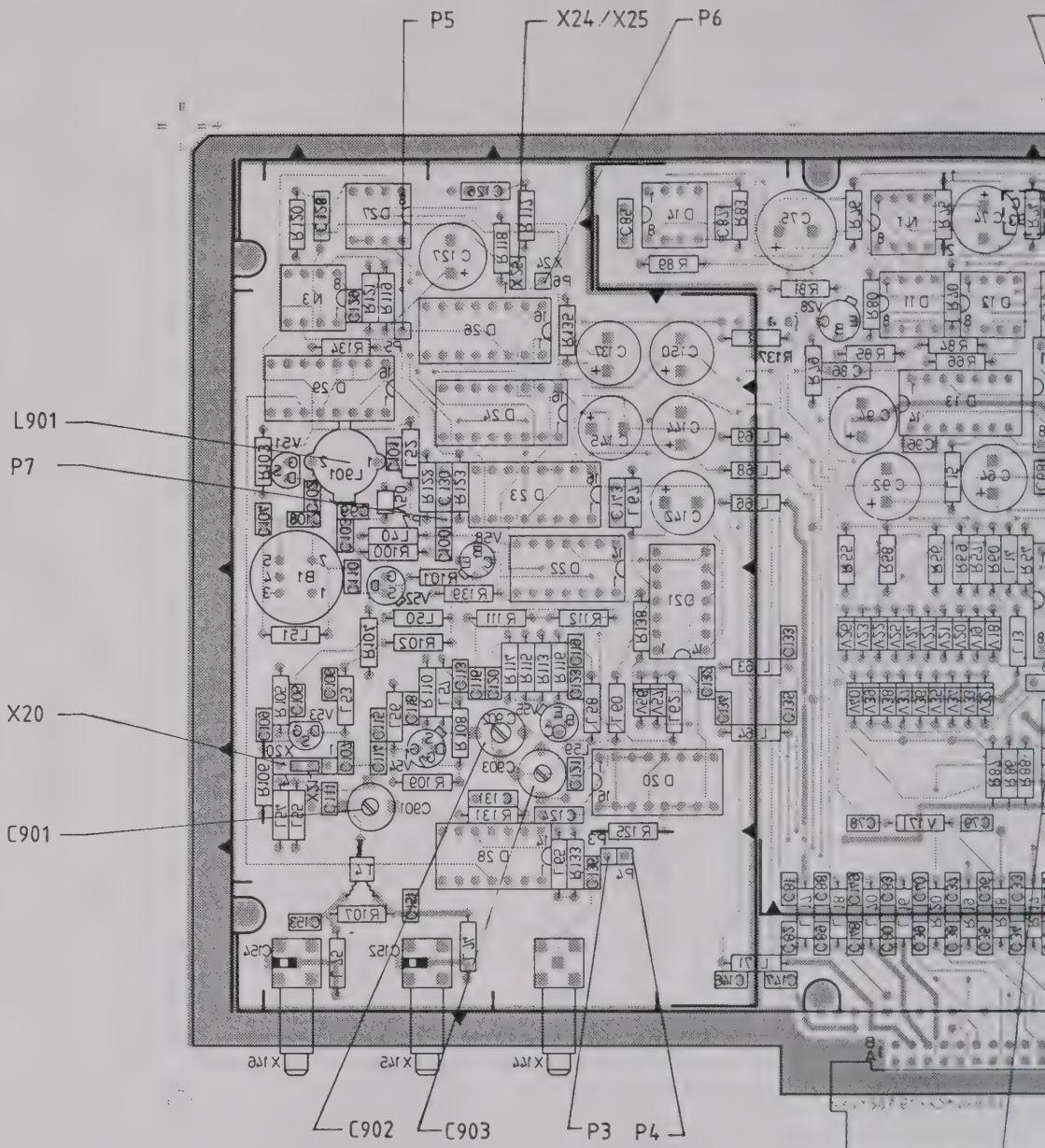


J	30401	6.83	NL	Maße ohne Toleranzangabe	Maßstab 1 : 1
K	30 989	11 83	NL		Halbzeug Werkstoff
				GMG Tag Name	Benennung
				Bearb 6.83 NL	Synthesizer 2
				Gepr	
				Norm	
				ROHDE & SCHWARZ	342.5003
Änd Zust	Änderungs Mitteilung	Tag	Name	zu Gerät ESV	ers. v 342.4020V erste Z 342.4020



Ansicht und Leitungsfuhrung Lötseite
View of tracks on solder side

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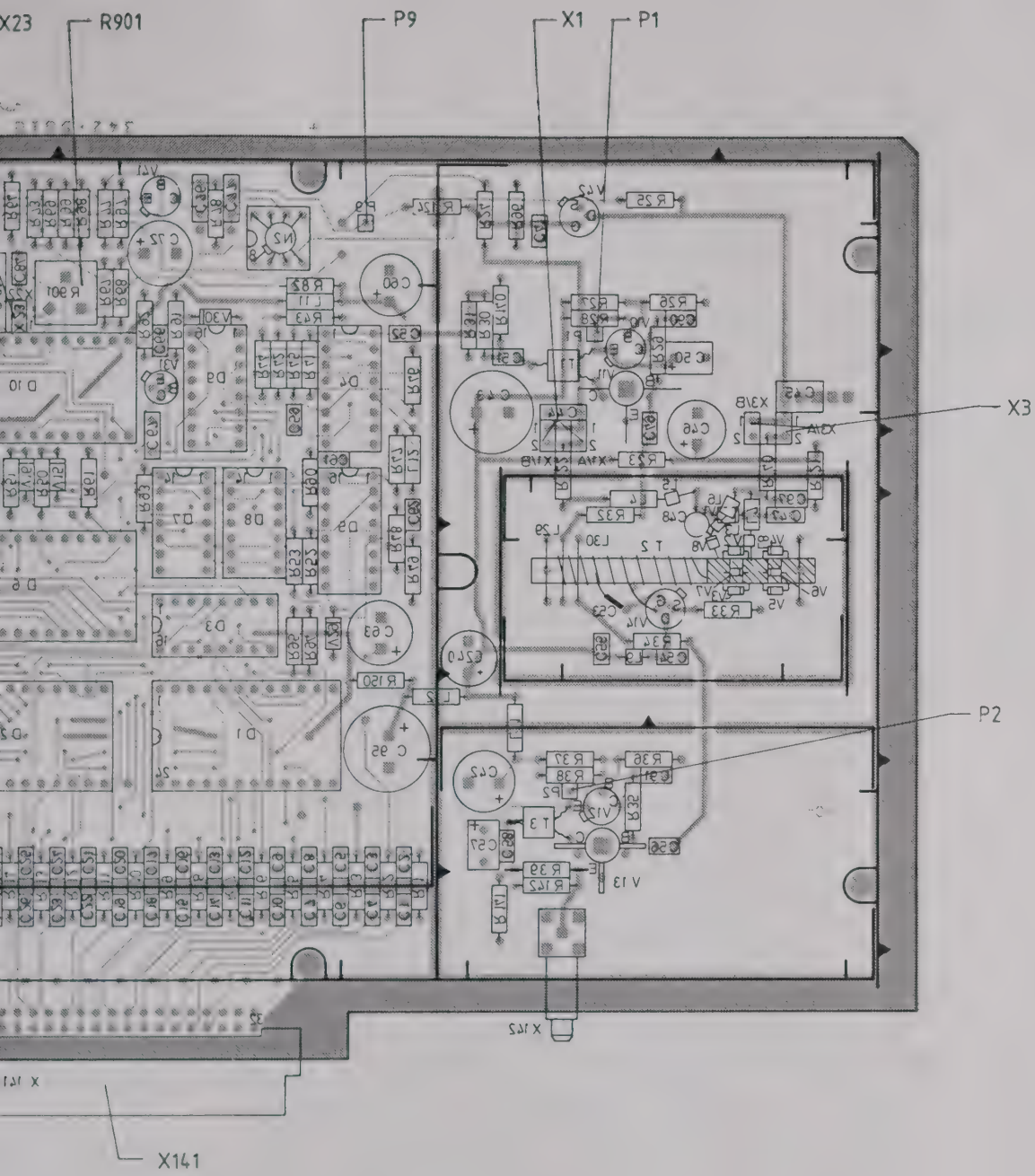

J	30401	6.83	NL	Maße ohne Toleranzangabe	Maßstab 1 : 1
K	30 989	11 83	NL		Halbzeug, Werkstoff
				1GMG Tag 6.83 Name NL	Benennung Synthesizer 2
				ROHDE & SCHWARZ ESV	342.5003 3
					reg V 342.4020 V erste Z 342.4020

And Zust | Änderungs Mitteilung

SERVICE INSTRUCTIONS

Synthesizer 1

342.5410.02

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Circuit diagram
Components location plan

5. Service Instructions for Synthesizer 1

(See circuit diagram 342.5410 S and block diagram Fig. 1)

5.1 Circuit Description

The synthesizer board 1 consists of the following functional groups:

- pulse generator n x 100 MHz;
- two VCOs for generation of frequencies n x 100 MHz comprising loop amplifier, lock-in identification and search generator;
- first oscillator comprising loop amplifier, lock-in identification and search generator;
- buffer amplifier for the first oscillator;
- mixer for mixing the output of the n x 100-MHz synthesizer and the first oscillator;
- 110.7-to-210.7-MHz filter and amplification section;
- mixer N5 acting as a phase comparator and finally
- logic circuit which selects the appropriate oscillator range from the control signals.

The block diagram of synthesizer 1 is shown in Fig. 1.

5.1.1 Auxiliary Synthesizer n x 100 MHz

The control signal 100 MHz (3 dBm) is applied to the pulse generator via X153. V1 boosts the power to 15 dBm. The required high-power pulse is produced in the step-recovery diode V2. C7, L3, C8 and L4 act as impedance transformer to the low internal impedance of the diode. The operating point of V2 is set with R900. The spectrum is attenuated by 10 dB and is available at X152 for measuring purposes. The high-pass filter consisting of C10, L5, C11, L6 and C12 has a cut-off frequency of 500 MHz and attenuates the first four insignificant spectral lines which keeps the load on the following mixer N1 low.

The auxiliary synthesizer frequency n x 100 MHz is produced in two oscillators covering the ranges 700 to 800 MHz and 900 to 1200 MHz. The oscillators are connected in a Colpitts circuit with V24 and V31 as active elements. They are switched on by means of V25 and V26 or V32 and V33, respectively. V22, V23, V29 and V30 act as tuning diodes. The oscillator power is brought out via two

coupling loops per oscillator i.e. one for synchronization of the oscillators and one for down-conversion of the frequency of the first oscillator. The coupling loops are switched over by means of the switching diodes V20, V21, V27 and V28.

The gain of the buffer amplifier connected between X4 and X2 is 0 dB. The reverse transmission is < 30 dB. RF amplification is accomplished by V16 and V35 whose frequency response compensation is ensured by C39 and C154.

The ring mixer N1 functions as a phase comparator. The mixer is match-terminated with C27, C25, L13, L14 and R22 for high frequencies.

The low-noise loop amplifier N6 provides an oscillator signal of high spectral purity. The PIP controller N6 features a DC voltage gain of 33. The output voltage at pin 6 is applied via R20 to the varicaps of the oscillators. V17 with the dropping resistor R20 prevents the varicaps from being connected with the wrong·polarity. The bandwidth of the PLL is about 1 MHz.

Normally a VCO is not at the desired nominal frequency at switch-on. Since the phase comparator N1 is only phase-selective but not frequency-selective first a search action of the oscillator must be initiated. This is accomplished by beating the DC tuning voltage at the oscillators with a 500-Hz AC search voltage. The 500-Hz generator is a FET oscillator with double T feedback. The search voltage is added at contact 2 of N6. The criterion for switching on the search generator is derived from the presence of an AC voltage of up to 50 MHz at the IF port of N1. The AC output voltage of N1 is boosted in V11 which is followed by a low-pass filter with a cut-off frequency of 50 MHz. V13 detects the signal and the resulting DC voltage is applied to the comparator N3. If the oscillator is out of lock, N3 switches on the search generator via V3 and pin a20 open-collector output of X151 is taken to ground via V14.

For pretuning of the VCOs, a DC voltage is used which is added at N6, pin 2. A potentiometer with associated switching transistor V53 to V58 is provided for each frequency range between 700 MHz and 1200 MHz in steps of 100 MHz for frequency presetting of the VCOs. The signal of the n x 100-MHz synthesizer is applied via a high-pass filter with a cut-off frequency of 500 MHz to the mixer N2.

5.1.2 Main Synthesizer

Like in the n x 100-MHz synthesizer, the frequency range of the first oscillator is covered by two oscillators. The Colpitts oscillator V106 acts as active element over the range from 690 MHz to 1010 MHz. Over the range 1010 MHz to 1330 MHz, the Colpitts oscillator V102 acts as active element. The oscillators are switched on by the transistors V103 and V230 or V107 and V231, respectively. V100 and V101 or V104 and V105, respectively, act as tuning diodes. The oscillator power of 3 dBm is brought out via a coupling loop which is terminated with R222.

The following two-stage buffer amplifier V69 and V71 can be disconnected by removing the link X10. The amplifier features a broadband constant gain of 17 dB over the frequency range from 680 MHz to 1350 MHz.

The oscillator signal is available at the output X155 with a level of 17 dBm via a high-pass filter with a cut-off frequency of 650 MHz and a low-pass filter with a cut-off frequency of 1350 MHz as well as a 3-dB attenuator. At X156 the signal of the first oscillator attenuated by 32 dB is available.

The signal of the first oscillator attenuated by 33 dB through R135, R139, R138 and R137 is coupled out at the input of the 3-dB attenuator for down-conversion. This is followed by a further two-stage buffer amplifier V67, V65. V66 and V64 stabilize again the operating point of V67 and V65. The amplifier features a broadband constant gain of 16 dB over the frequency range 680 to 1350 MHz.

The oscillator signal is applied with a level of -20 dBm via an attenuator to the mixer N2 where it is down-converted with the signal of the auxiliary n x 100-MHz synthesizer to 110.7 to 210.7 MHz.

The filter following the IF gate of the mixer N2 can be disconnected by removing the link X8. Termination for high frequencies is provided by R107, R108 and C160. Signals with frequencies below 230 MHz are applied to X9 via a low-pass filter. This is followed by a two-stage buffer amplifier with V61 and V63. Broadband frequency response compensation is ensured by C70, R114 and C161, R106. The high-pass filter C162, L37 and C71 features a cut-off frequency of 100 MHz determining the lower frequency limit of the 110.7-to-210.7-MHz amplifier. A 3-dB attenuator and another 100-MHz high-pass filter are connected between V63 and X11. The overall gain of the 110.7-to-210.7-MHz section is 16 dB.

A frequency between 110.7 MHz and 210.7 MHz depending on the desired first oscillator frequency is fed into X154. This frequency is down-converted to 0 in N5 with the signal from the 110.7-to-210.7-MHz amplification section. The IF port of N5 is match-terminated with C103 and R160 for high frequencies. The low-frequency or DC voltage component is applied via X15 to the loop amplifier N7. The low-noise loop amplifier ensures a signal of the first oscillator of high spectral purity. The PIP controller N7 features a DC voltage gain of 55. The output voltage at pin 6 is applied via R182 to the varicaps of the oscillators. V120 with the dropping resistor R182 prevents the varicaps from being connected with the wrong polarity. The bandwidth of the PLL is about 2 MHz.

Normally a VCO is not at the desired nominal frequency at switch-on. Since the phase comparator N5 is only phase-selective but not frequency-selective first a search action of the oscillator must be initiated. This is accomplished by beating the tuning voltage at the oscillators with a 500-Hz AC search voltage. The 500-Hz generator is a FET oscillator with double T feedback. The search voltage is added at contact 2 of N7.

The criterion for switching on the search generator is derived from the presence of an AC voltage of up to 100 MHz at the IF port of N5. The AC output voltage of N5 is boosted in V79 which is followed by a low-pass filter with a cut-off frequency of 100 MHz. V82 detects the signal and the resulting DC voltage is applied to the comparator via V85 and pin b20 open-collector output of X151 is taken to ground via V83.

For pretuning of the VCOs, a DC voltage is used which is added at N7, pin 2. A potentiometer (R903, R910 to R917) with associated switching transistor (V52, V92 to V99) is provided for each of the 100-MHz ranges (see Table 1) for frequency presetting of the VCOs.

The digital chip N8 and a switching diode array decode the BCD information present at X151, pins b27 to b30 into the decimal equivalent for controlling the oscillators. N9 is a full adder which adds 0 to the 100-MHz digit applied at b27 to b30 if a19 of X151 is at high level or 5 if a19 of X151 is at low level. With a30 being at high, N8 is disabled and the frequency information must be applied via a/b8 to a/b10.

All RF connections to and in the synthesizer 1 are of 50-Ω design facilitating adjustment of the synthesizer 1 with standard measuring instruments.

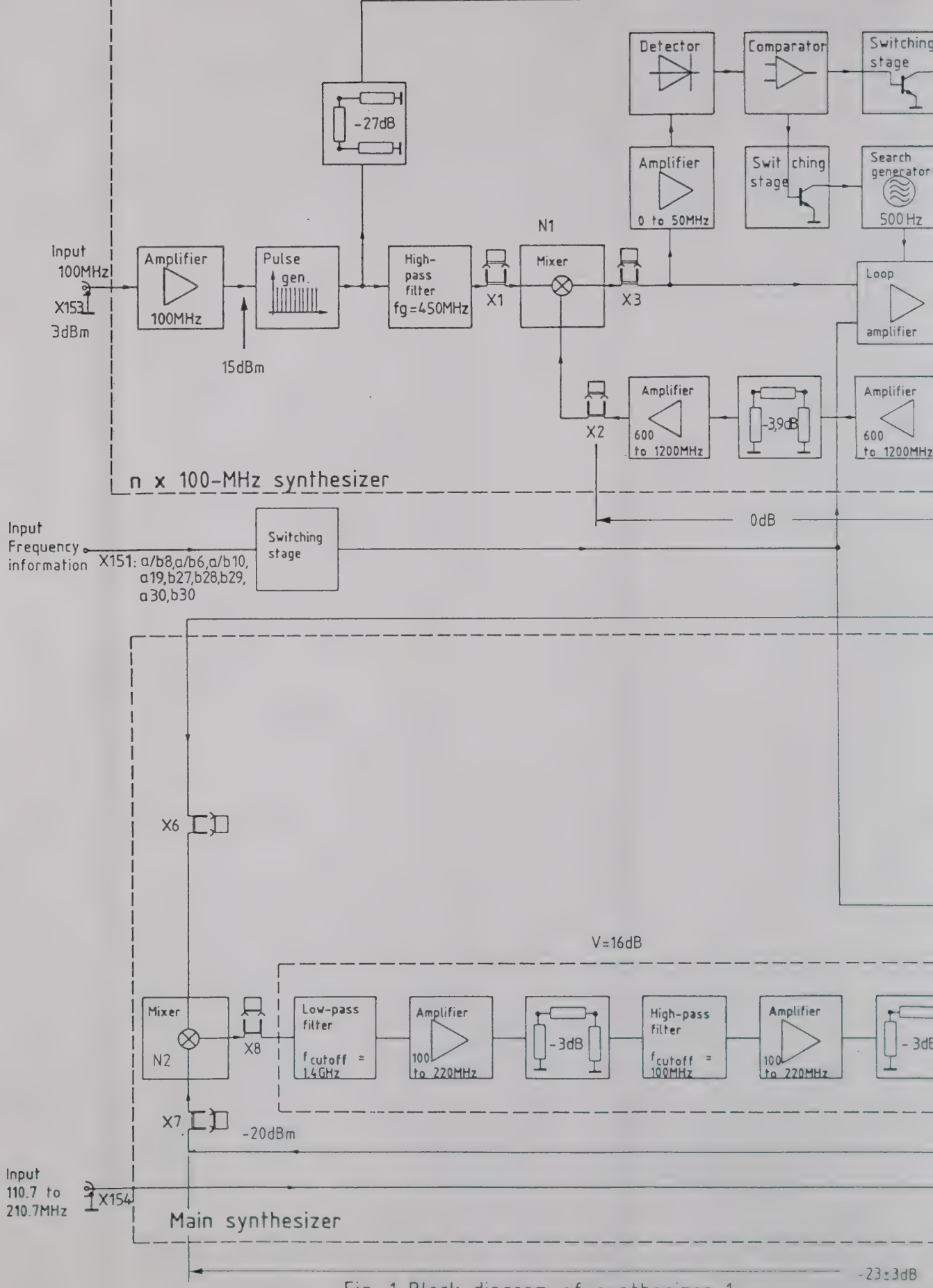
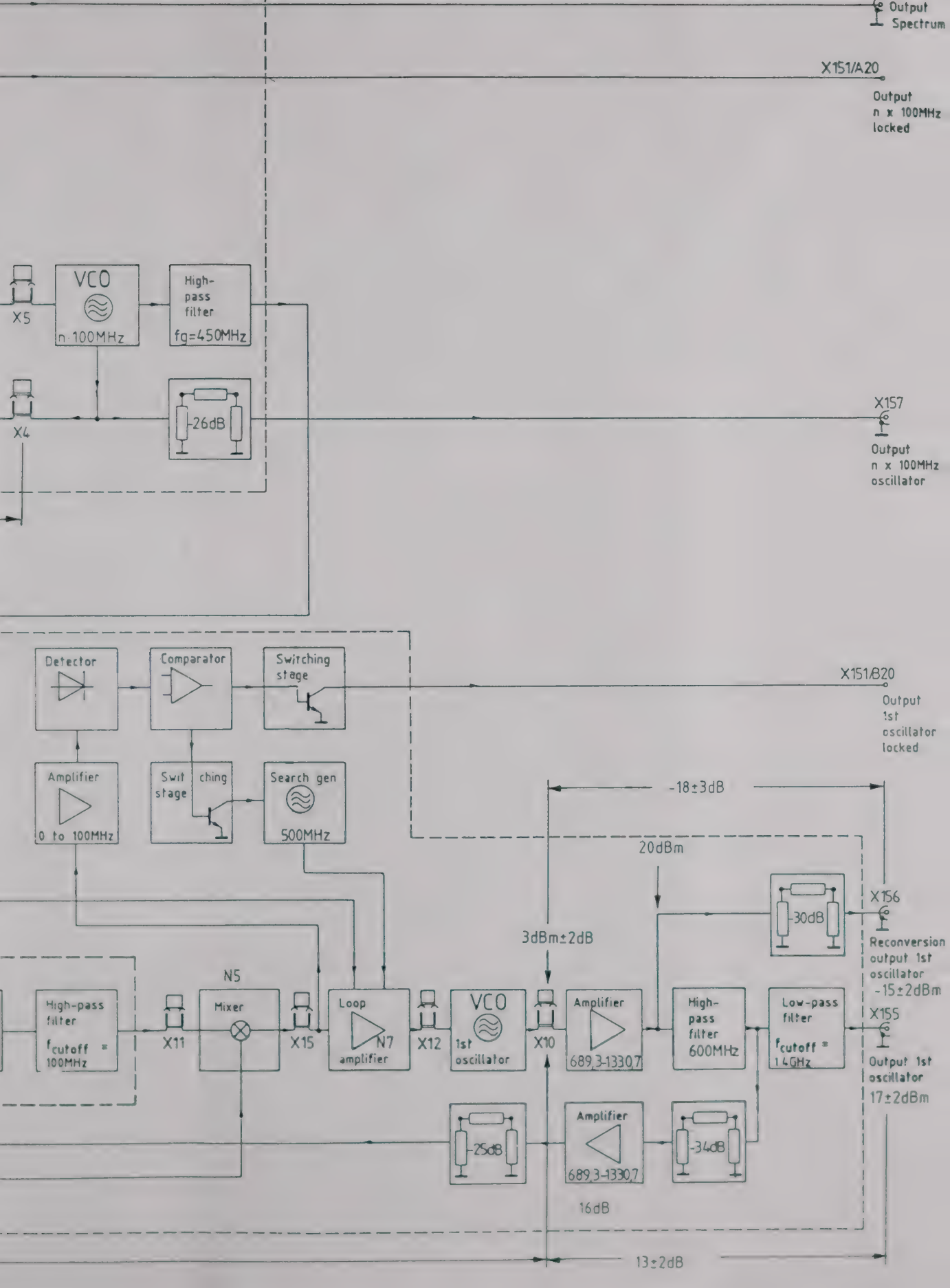


Fig. 1 Block diagram of synthesizer 1


Output Spectrum
X151/A20
Output n x 100MHz locked
VCO
n·100MHz
High-pass filter
fg=450MHz
X5
X4
-26dB
X157
Output n x 100MHz oscillator
Detector
Comparator
Switching stage
X151/B20
Output 1st oscillator locked
Amplifier
0 to 100MHz
Swit ching stage
Search gen
500MHz
-18±3dB
20dBm
3dBm±2dB
-30dB
X156
Reconversion output 1st oscillator -15±2dBm
X155
Output 1st oscillator 17±2dBm
N5
High-pass filter
fcutoff = 100MHz
X11
Mixer
X15
Loop amplifier
N7
X12
VCO
1st oscillator
X10
Amplifier
689,3-1330,7
High-pass filter 600MHz
Low-pass filter
fcutoff = 1,4GHz
-25dB
Amplifier
689,3-1330,7
-34dB
16dB
13±2dB

5.2 Checking and Adjustment Procedures

5.2.1 Current and Voltages

Checking the current drain

Voltage	Tolerance	Current	Tolerance	Pin
+5.3 V	±0.1 V	10 mA	±5 mA	a/b2
+12 V	±0.1 V	190 mA	±20 mA	a/b3
+10 V	±10 mV	30 mA	±5 mA	a4
-10 V	±0.1 V	110 mA	±30 mA	b4
+30 V	±0.1 V	11 mA	±5 mA	a5
0	-	-	-	a/b1

5.2.2 Checking the Oscillator Presetting

Table 1 lists the voltages which must be present at the diode matrix for oscillator presetting if the appropriate signals are applied to a/b8, a/b9, a/b10, a30, b27 to b30 and a19.

5.2.3 Checking and Adjustment of the Pulse Generator

- Remove the link X1 to interrupt the connection between the pulse generator and N1.
- Connect a spectrum analyzer to X1.
- Feed 100-MHz signal with a level of +3 dBm to X153.

Set the operating point of the step-recovery diode V2 to 1 mA by means of R900. This current can be measured as a voltage drop of 100 mV across R5. The level of the spectral lines measured at X1 should be -13 dBm ±3 dB. The level can be adjusted by means of L3. Check the performance of the pulse generator over the temperature range -10°C to +75°C. If necessary, slight adjustment is possible by means of R900.

5.2.4 Checking and Adjustment of the n x 100-MHz Oscillators

- Remove the link X6 to interrupt the connection between the n x 100-MHz oscillators and N2. Terminate the oscillators at X6 with 50 Ω.
- Remove the link X4 and connect a spectrum analyzer to the oscillator output X4.

Table 1 Oscillator presetting

Presetting										
a30	a19	b30	b29	b28	b27	a/b8	a/b9	a/b10	Osc. n x 100 MHz f/MHz	Subra of n x Osc.
L	H	L	L	L	L	H	H	H	700	700 t
L	H	L	L	L	H	H	H	H	800	700 t
L	H	L	L	H	L	H	H	H	900	900 t
L	H	L	L	H	H	H	H	H	1000	900 t
L	H	L	H	L	L	H	H	H	1100	900 t
L	H	L	H	L	H	H	H	H	1200	900 t
L	L	L	H	L	H	H	H	H	700	700 t
L	L	L	H	H	L	H	H	H	800	700 t
L	L	L	H	H	H	H	H	H	900	900 t
L	L	H	L	L	L	H	H	H	1000	900 t
L	L	H	L	L	H	H	H	H	1100	900 t
H	D	D	D	D	D	L	H	H	900	900 t
H	D	D	D	D	D	H	L	H	1000	900 t
H	D	D	D	D	D	H	H	L	1100	900 t

H = high level
L = low level
D = don't care

Test parameter				
	Tuning voltage of n x 100 MHz Osc./V	1st oscillator f/MHz	Subrange of 1st oscillator f/MHz	Tuning voltage of 1st Osc./V
	7.8	830.7 to 910.799	689.3 to 1010.7	9 to 12.2
	11.9	910.7 to 1010.799	1010.7 to 1330.7	12.2 to 17
0	2	1010.7 to 1110.799	1010.7 to 1330.7	3 to 8.1
0	6.8	1010.7 to 1210.799	1010.7 to 1330.7	8.1 to 12.7
0	10.5	1210.7 to 1310.799	1010.7 to 1330.7	12.7 to 17.5
0	14	1310.7 to 1330.799	689.3 to 1010.7	17.5 to 18.8
	7.8	830.7 to 910.799	689.3 to 1010.7	9 to 12.2
	11.9	910.7 to 1010.799	689.3 to 1010.7	12.2 to 17
0	2	1010.7 to 1110.799	1010.7 to 1330.7	3 to 8.1
0	6.8	1110.7 to 1210.799	1010.7 to 1330.7	8.1 to 12.7
0	10.5	1210.7 to 1310.799	1010.7 to 1330.7	12.7 to 17.5
0	2	689.3 to 789.299	689.3 to 1010.7	4.3 to 8.2
0	6.8	789.3 to 889.299	689.3 to 1010.7	8.2 to 11.4
0	10.5	889.3 to 989.299	689.3 to 1010.7	11.4 to 15.1

5.2.4.1 700-to-800-MHz Oscillator

- a19 of X151 at high level.

Adjust the series inductance of V22 and V23 such that the frequency range 550 to 950 MHz can be covered with R904. Subsequently adjust the coupling loop between V21 and R45 such that the level over the frequency range 700 to 800 MHz is 2 dBm ±2 dB.

5.2.4.2 900-to-1200-MHz Oscillator

- a19 of X151 at high level.
- b28 of X151 at high level.

Adjust the series inductance of V29 to V30 such that the frequency range 800 to 1300 MHz can be covered with R906.

Subsequently adjust the coupling loop between V28 and R51 such that the level over the frequency range 900 to 1200 MHz is 2 dBm ±2 dB.

5.2.5 Adjustment of the Main Coupling Loops of the n x 100-MHz Oscillators

Remove the link X6 and connect a spectrum analyzer to the oscillator output of X6.

5.2.5.1 Coupling Loop at the 700-to-800-MHz Oscillator

- a19 of X151 at high level.

Adjust the coupling loop between V20 and R43 such that the level over the frequency range 700 to 800 MHz is 2 dBm ±2 dB.

5.2.5.2 Coupling Loop at the 900-to-1200-MHz Oscillator

- a19 of X151 at high level.
- b28 of X151 at high level.

Adjust the coupling loop between V27 and R58 such that the level over the frequency range 900 to 1200 MHz is 2 dBm ±2 dB.

5.2.6 Checking the Buffer Amplifier in the n x 100-MHz Synthesizer

- Remove the links X2 and X4.
- Connect a network analyzer to X4 and X2 such that the signal is fed into X4.

Gain over the frequency range 650 to 1250 MHz ..... 0 ±2 dB

5.2.7 Checking the Loop Amplifier, the Lock-in Identification and the Search Generator in the n x 100-MHz Synthesizer

- Remove the link X6 and connect a spectrum analyzer to A1 of X6.
- X153 must be left free.
- a19 of X151 at high level.
- Tune oscillator frequency to 700 MHz by means of R904.

5.2.7.1 Checking the Search Generator

Connect pins 1 and 2 at X13.
Oscillator sweep width ..... ±35 MHz

5.2.7.2 Checking the Lock-in Identification

Feed 100-MHz signal with a level of 3 dBm into X153.
The oscillator should lock at 700 MHz.

5.2.8 Frequency Adjustment of n x 100-MHz Synthesizer

- Feed 95-MHz signal with a level of 3 dBm into X153.
- a19 of X151 at high level
- Remove the link X6 and connect a spectrum analyzer to A1 of X6.
- Apply a high signal in BCD format according to the desired frequency to b27 to b30 of X151.

Adjust the n x100-MHz oscillators by means of R904 to R909 such that a balanced sweep width is produced about the desired n x 100-MHz frequency.

Then feed 100-MHz signal with a level of 3 dBm into X153. The oscillators should now lock at n x 100 MHz.

5.2.9 Checking and Adjustment of the 110.7-to-210.7-MHz Amplification Section

5.2.9.1 Adjustment of the 220-MHz Low-pass Filter

- Remove the links X8 and X9.
- Connect a network analyzer to X8 and X9.

Adjust L32 to L36 for uniform return loss over the range 100 to 220 MHz.

5.2.9.2 Checking the Gain of the 110.7-to-210.7-MHz Section

- Remove the links X8 and X11 and link A1 and B1 at X9.
- Connect a network analyzer to X8 and X11 such that the signal is fed into X8.

Gain over the frequency range 110.7 to 210.7 MHz ..... 16 ±2 dB

5.2.10 Frequency and Level Adjustment of the First Oscillator

Remove the link X10 and connect a spectrum analyzer to A1 of X10.

5.2.10.1 689-to-1010-MHz Oscillator

- a19 of X151 at high level.

Adjust the series inductance of V104 and V105 such that the frequency range 600 to 1100 MHz can be covered with R910.

5.2.10.2 1010-to-1330-MHz Oscillator

- a19 and b28 of X151 at high level.

Adjust the series inductance of V100 and V101 such that the frequency range 900 to 1400 MHz can be covered with R912.

5.2.10.3 Level Adjustment in the Frequency Range 689 to 1330 MHz

Adjust the coupling loop between R222 and X10 such that the level over the frequency range 650 to 1010 MHz and 1010 to 1400 MHz is 3 dBm ±2 dB.

5.2.11 Adjustment of the Output High-pass and Low-pass Filters and Checking the Gain of the Oscillator Amplifier

- Remove the link X10.
- Connect a network analyzer to X10 and X155 such that the signal is fed into X10/B1.
- Adjust the high-pass filter by means of L45 and L46 such that a flat frequency response is obtained especially over the frequency range 680 to 900 MHz.
- Adjust the low-pass filter by means of L160 to L162 such that a flat frequency response is obtained especially over the frequency range 900 to 1350 MHz.
- Cut-off frequency of the low-pass filter ..... 1350 MHz
- Gain ..... 13 ±2 dB

5.2.12 Checking the Gain at the Reconversion Output and at the Buffer Amplifier Output

- Remove the link X10.
- Connect a network analyzer to X10 and X156 such that the signal is fed into X10/B1.
- Terminate X155 with 50 Ω.
- Remove the link X7.

Attenuation over the frequency range 650 to 1350 MHz ..... -18 ±3 dB
Attenuation between X10/B1 and X7 ..... -23 ±3 dB

5.2.13 Checking the Loop Amplifier, the Lock-in Identification and the Search Generator in the Main Synthesizer

- Connect a spectrum analyzer to X155.
- a19 of X151 at high level.
- Tune the oscillator frequency to 860 MHz by means of R910.
- Feed 160-MHz signal with a level of 3 dBm into X154.
- Put the n x 100-MHz synthesizer into operation.

5.2.13.1 Checking the Search Generator

- Connect an oscilloscope to R169.

- Link 1 and 2 at X14.

A search voltage with a frequency of 500 Hz ±30% and a voltage of approximately 5 V_{pp} should be measured with the oscilloscope.

5.2.13.2 Checking the Loop Amplifier and the Lock-in Identification

- Remove the link X14.

Vary the frequency of the signal fed in at X154 until the oscillator goes out of lock. Then sweep the oscillator with a sweep width of approximately 75 MHz about its centre frequency.

5.2.14 Frequency Adjustment of the Main Synthesizer

- Put the n x 100-MHz synthesizer into operation.
- Connect a spectrum analyzer to X155.
- a19 of X151 at high level.
- Apply a high signal to pins b27 to b30 of X151 or low signal to ab8 to ab10 of X151 according to the desired frequency.
- X154 must be left free.

Adjust the frequencies to the centre values of the various ranges according to Table 1 using R903 and R910 to R917. After feeding 160 MHz with 3 dBm into X154, the oscillators in every range should lock. Subsequently check the tuning range. To this end, tune through the frequency range of the signal applied to X154 from 100 to 220 MHz. The first oscillator must remain locked. An exception is the range from 1310.7 to 1330.7 MHz in which the signal applied to X154 need only be tuned through the frequency range 100 to 150 MHz.

If one of the tuning subranges cannot be obtained without the first oscillator going out of lock, slightly readjust R903 and R910 to R917.

5.2.15 Checking the Oscillator Output Power

- Connect a power meter to X155.

Check the output power over the frequency range 689.3 to 1330.7 MHz (frequency setting according to Table 1).

- Oscillator output power at X155 ..... 17 ±2 dBm

If necessary, readjust coupling loop between R222 and X10 as well as L45, L46 and L162 of the output high-pass and low-pass filters.

5.2.16 Checking the Power at the Oscillator Reconversion Output

- Connect a power meter to X156.

Output power over the frequency range 689.3 to 1330.7 MHz ..... 15 $^{+2}_{-3}$ dBm

If necessary, the output power can be adjusted via the coupling loop between R441 and X156.

5.2.17 Checking the Sideband Noise of the First Oscillator

- Apply a low-noise crystal signal (100 MHz/3 dBm) to X153.
- Apply a low-noise signal with the frequencies 110.7 MHz, 160 MHz and 210.7 MHz according to the test frequency to X154.
- Connect a sideband noise meter to X155.

Check the sideband noise at three points in every range according to Table 1 (except for range 1310 to 1330 MHz where only one point need be checked and range 830.7 to 910 MHz where checking is required at two points).
Fig. 2 shows the typical characteristic of the sideband noise.

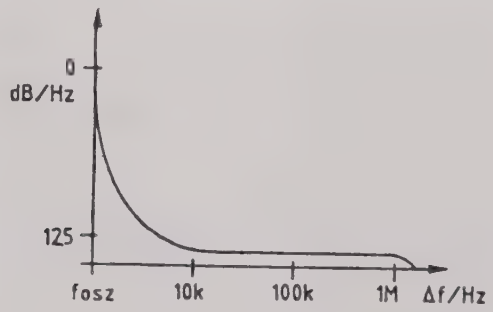
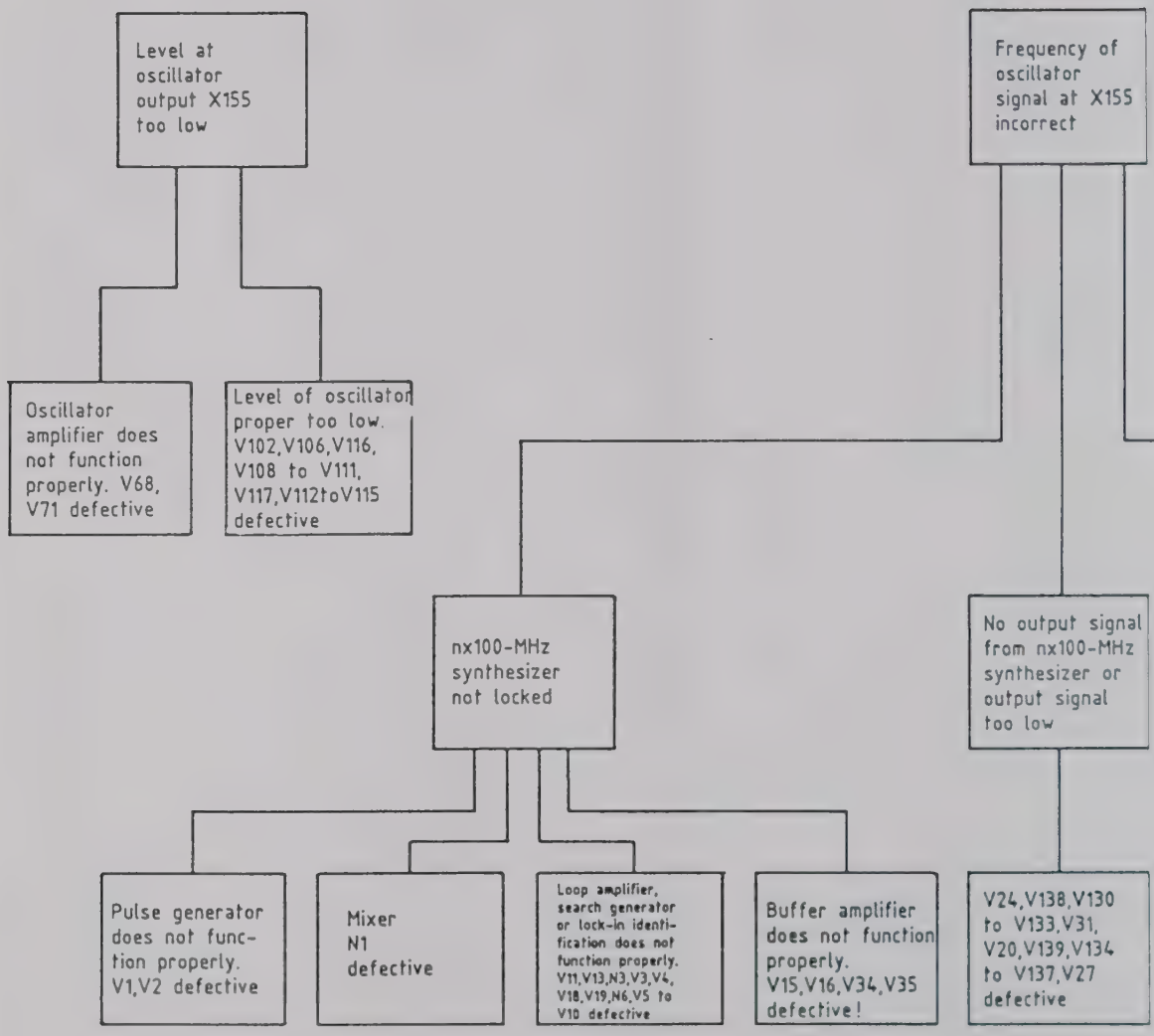
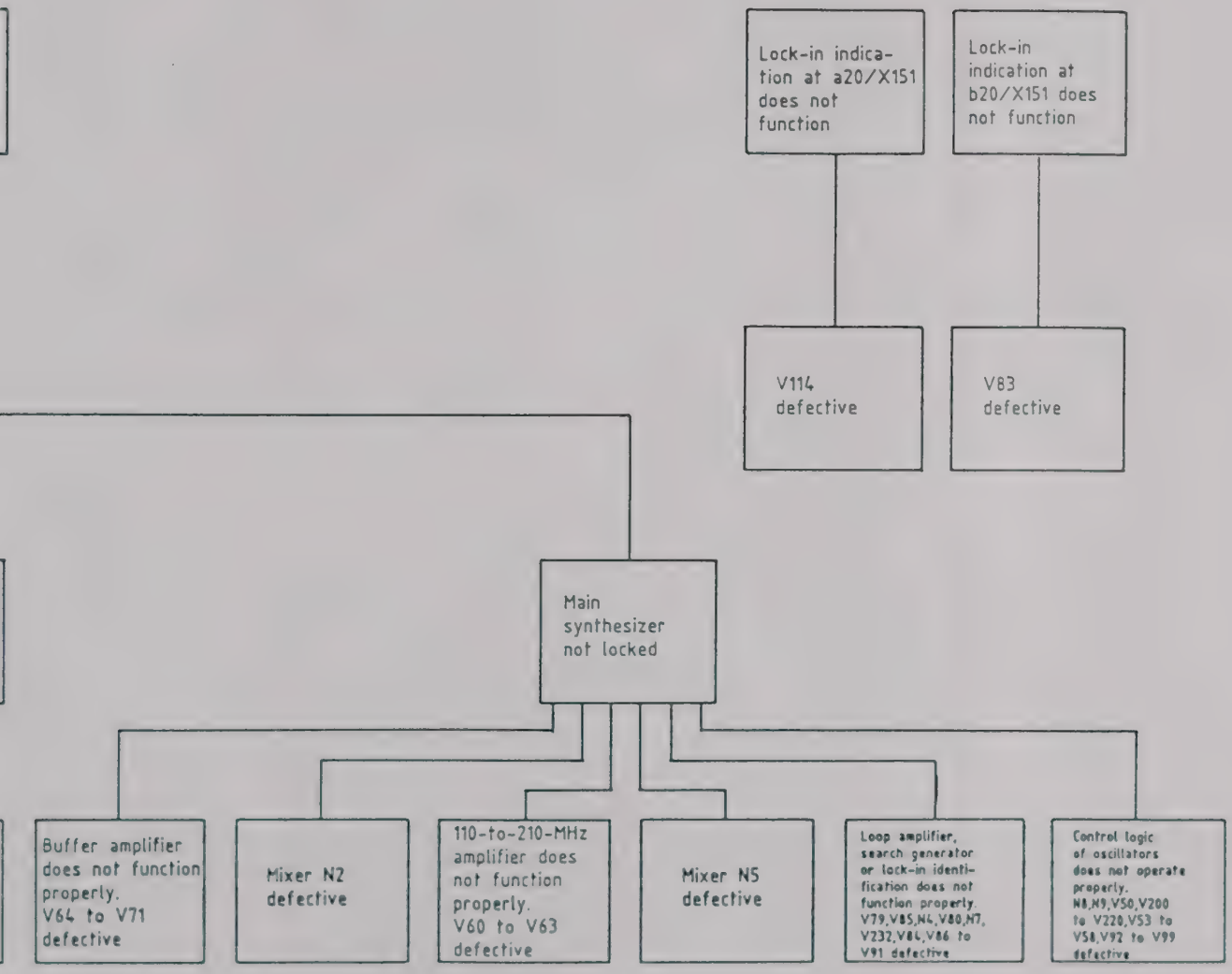


Fig. 2 Characteristic of typical sideband noise level of the first oscillator


Level at oscillator output X155 too low
Frequency of oscillator signal at X155 incorrect
Oscillator amplifier does not function properly. V68, V71 defective
Level of oscillator proper too low. V102,V106,V116, V108 to V111, V117,V112toV115 defective
nx100-MHz synthesizer not locked
No output signal from nx100-MHz synthesizer or output signal too low
Pulse generator does not function properly. V1,V2 defective
Mixer N1 defective
Loop amplifier, search generator or lock-in identification does not function properly. V11,V13,N3,V3,V4, V18,V19,N6,V5 to V10 defective
Buffer amplifier does not function properly. V15,V16,V34,V35 defective!
V24,V138,V130 to V133,V31, V20,V139,V134 to V137,V27 defective

342.5410.02


Lock-in indication at a20/X151 does not function
Lock-in indication at b20/X151 does not function
V114 defective
V83 defective
Main synthesizer not locked
Buffer amplifier does not function properly. V64 to V71 defective
Mixer N2 defective
110-to-210-MHz amplifier does not function properly. V60 to V63 defective
Mixer N5 defective
Loop amplifier, search generator or lock-in identification does not function properly. V79,V85,N4,V80,N7, V232,V84,V86 to V91 defective
Control logic of oscillators does not operate properly. N8,N9,V50,V200 to V220,V53 to V58,V92 to V99 defective

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CC 47PF+-2%5X6NP0 CAPACITOR VALVO 2222 678 10479	CC 087.6506	
C2	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C3	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C4	CC 22PF+-2%6X9P100 CAPACITOR VALVO 2222 678 04229	CC 087.6335	
C5	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C6	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
C7	CC 220PF+50-20%5R2000 CAPACITOR	CC 022.4838	
C8	CC 470PF-20+50%R2000TRAP. CAPACITOR	CC 083.6776	
C9	CC 2,7PF+-0,25PF3X4NP0 CERAMIC CAPACITOR VALVO 2222 678 09278	CC 087.6358	
C10	CC 6,8PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09688	CC 087.6406	
C11	CC 3,9PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09398	CC 087.6370	
C12	CC 6,8PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09688	CC 087.6406	
C13	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C14	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C15	CC 100NF+-10%100V8K1200LR CAPACITOR AEROVOX CKR06BX104KLEVELR	CC 092.0890	
C16	CC 100NF+-10%100V8K1200LR CAPACITOR AEROVOX CKR06BX104KLEVELR	CC 092.0890	
C17	CC 2,7NF+-10%5X6R2000 CAPACITOR VALVO 2222 63051 272	CC 087.7077	
C18	CC 1UF +-10% 50VK1200LR CAPACITOR AEROVOX CKR06BX105KLEVELR	CC 092.1015	
C19	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR2-10/15	CE 022.8085	
C20	CC 10NF-20+50%7X8R6000	CC 087.7525	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	CAPACITOR		
	VALVO 2222 63051 64051103		
C21	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C22	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C23	CC 100NF+-10%100V8K1200LR	CC 092.0890	
	CAPACITOR		
	AEROVOX CKR06BX104KLEVELR		
C24	CC 100NF+-10%100V8K1200LR	CC 092.0890	
	CAPACITOR		
	AEROVOX CKR06BX104KLEVELR		
C26	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C27	CC 33PF+-2%4X5NP0	CC 087.6487	
	CAPACITOR		
	VALVO 2222 678 10339		
C28	CC 10PF+-0,25PF3X4NP0	CC 087.6429	
	CAPACITOR		
	VALVO 2222 678 09109		
C29	CC 1NF+-10%63V K2000	CC 022.0784	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 102		
C30	CC 15PF+-2%3X4NP0	CC 087.6441	
	CAPACITOR		
	VALVO 2222 678 10159		
C31	CC 560PF+-10%3X4R2000	CC 087.7002	
	CERAMIC CAPACITOR		
	VALVO 2222 63051 561		
C32	CE 10 UF+-20%16V 7X 4X 8	CE 022.8085	
	ELECTROLYTIC CAPACITOR		
	ERO-TANTAL TA-ELKOETR2-10/15		
C33	CC 1UF +-10% 50VK1200LR	CC 092.1015	
	CAPACITOR		
	AEROVOX CKR06BX105KLEVELR		
C34	CC 1UF +-10% 50VK1200LR	CC 092.1015	
	CAPACITOR		
	AEROVOX CKR06BX105KLEVELR		
C35	CC 2,7PF+-0,25PF3X4NP0	CC 087.6358	
	CERAMIC CAPACITOR		
	VALVO 2222 678 09278		
C36	CC 100PF+-10%200V5K1200VI	CC 084.5250	
	CAPACITOR		
	AEROVOX CKR05BX101KLEVELL		
C39	CC 1,5PF+-0,25PF3X4P100	CC 087.6193	
	CAPACITOR		
	VALVO 2222 678 03158		
C40	CC 180PF+-10%50C3NP0CHIP	CC 082.3138	
	CAPACITOR		
	VITRAMON VJ1005A181KFE		
C41	CC 180PF+-10%50C3NP0CHIP	CC 082.3138	
	CAPACITOR		
	VITRAMON VJ1005A181KFB		
C42	CC 180PF+-10%50C3NP0CHIP	CC 082.3138	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	CAPACITOR VITRAMON VJ1005A181KFB		
C43	CC 180PF+-10%50C3NP0CHIP CAPACITOR VITRAMON VJ1005A181KFB	CC 082.3138	
C44	CC 5,2PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJ0805A5R2CFA	CC 093.5650	
C45	ENTHALTEN IN/INCLUDED IN 342.5426		
C46	KONDENSATOR 0,6PF 2,5X2,8	093.5772	
C47	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
C48	CC 3,6PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJ0805A3R6CFA	CC 093.5614	
C49	ENTHALTEN IN/INCLUDED IN 342.5426		
C50	CC 100NF+-10% 50V5K1200LR CAPACITOR AEROVOX CKR05BX104KLEVELR	CC 092.0777	
C51	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
C52	CC 1UF +-10% 50VK1200LR CAPACITOR AEROVOX CKR06BX105KLEVELR	CC 092.1015	
C53	CC 1UF +-10% 50VK1200LR CAPACITOR AEROVOX CKR06BX105KLEVELR	CC 092.1015	
C57	CC 2,6PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJ0805A2R6CFA	CC 093.5572	
C58	CC 5,2PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJ0805A5R2CFA	CC 093.5650	
C59	CC 5,2PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJ0805A5R2CFA	CC 093.5650	
C60	CC 12PF+-1%50V1NP0 CHIP CAOACITOR VITRAMON VJC504A120FFA	CC 093.3563	
C61	CC 4,7PF+-0,5PF100V3NP0 C CAPACITOR VITRAMON VJ1005A4R7DFB	CC 082.2977	
C62	CC 12PF+-1%50V1NP0 CHIP CAOACITOR VITRAMON VJC504A120FFA	CC 093.3563	
C63	CC 18PF+-2%3X4NP0 CAPACITOR VALVO 2222 678 10189	CC 087.6458	
C64	CC 22PF+-2%4X5NP0 CAPACITOR VALVO 2222 678 10229	CC 087.6464	
C65	CC 22PF+-2%4X5NP0 CAPACITOR	CC 087.6464	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	VALVO 2222 678 10229		
C66	CC 18PF+-2%3X4NP0 CAPACITOR	CC 087.6458	
	VALVO 2222 678 10189		
C67	CC 1NF+-10%100V2K1200CHIP CAPACITOR	CC 082.7385	
	VITRAMON VJ0805Y102KFA		
C68	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	
	VALVO 2222 63051 102		
C69	CE 22 UF+-20%16V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 022.8091	
	ERO-TANTAL TA-ELKO ETR3-22/15		
C70	CC 10PF+-0,25PF3X4NP0 CAPACITOR	CC 087.6429	
	VALVO 2222 678 09109		
C71	CC 56PF+-2%5X6NP0 CAPACITOR	CC 087.6512	
	VALVO 2222 678 10569		
C72	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	
	VALVO 2222 63051 102		
C73	CE 22 UF+-20%16V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 022.8091	
	ERO-TANTAL TA-ELKO ETR3-22/15		
C74	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	
	VALVO 2222 63051 102		
C75	CC 33PF+-2%4X5NP0 CAPACITOR	CC 087.6487	
	VALVO 2222 678 10339		
C76	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8085	
	ERO-TANTAL TA-ELKOETR2-10/15		
C77	CC 10NF-20+50%7X8R6000 CAPACITOR	CC 087.7525	
	VALVO 2222 63051 64051103		
C78	CC 1,5PF+-0,25PF3X4P100 CAPACITOR	CC 087.6193	
	VALVO 2222 678 03158		
C79	CC 10PF+-0,25PF3X4NP0 CAPACITOR	CC 087.6429	
	VALVO 2222 678 09109		
C80	CC 100PF+-2%6X9NP0 CAPACITOR	CC 087.6541	
	VALVO 2222 678 10101		
C81	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8085	
	ERO-TANTAL TA-ELKOETR2-10/15		
C82	CC 10NF-20+50%7X8R6000 CAPACITOR	CC 087.7525	
	VALVO 2222 63051 64051103		
C83	CC 10PF+-0,25PF3X4NP0 CAPACITOR	CC 087.6429	
	VALVO 2222 678 09109		
C84	CC 4,3PF+-0,25PF50V2NP0 CAPACITOR	CC 093.5643	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	VITRAMON VJC805A4R3CFA		
C85	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR2-10/15	CE 022.8085	
C86	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C87	CC 2,3PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJC805A2R3CFA	CC 093.5566	
C88	CC 5,2PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJC805A5R2CFA	CC 093.5650	
C89	CC 100PF+-2%6X9NP0 CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C90	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR2-10/15	CE 022.8085	
C91	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C92	CC 2,9PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJC805A2R9CFA	CC 093.5589	
C93	CC 2,1PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJC805A2R1CFA	CC 093.5550	
C100	CC 100NF+-10%100V8K120CLR CAPACITOR AEROVOX CKRC6BX104KLEVELR	CC 092.0890	
C101	CC 100NF+-10%100V8K120CLR CAPACITOR AEROVOX CKRC6BX104KLEVELR	CC 092.0890	
C102	CC 1UF +-10% 50VK120CLR CAPACITOR AEROVOX CKRC6BX105KLEVELR	CC 092.1015	
C104	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C105	CC 100NF+-10%100V8K120CLR CAPACITOR AEROVOX CKRC6BX104KLEVELR	CC 092.0890	
C106	CC 10PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09109	CC 087.6429	
C107	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C108	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C109	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C110	CC 100NF+-10%100V8K120CLR CAPACITOR	CC 092.0890	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	AEROVOX CKR06BX104KLEVELR		
C111	CC 2,7NF+-10%5X6R2000 CAPACITOR	CC 087.7077	
	VALVO 2222 63051 272		
C112	CC 1UF +-10% 50VK1200LR CAPACITOR	CC 092.1015	
	AEROVOX CKR06BX105KLEVELR		
C113	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8085	
	ERO-TANTAL TA-ELKOETR2-10/15		
C114	CC 100NF+-10%100V8K1200LR CAPACITOR	CC 092.0890	
	AEROVOX CKR06BX104KLEVELR		
C115	CC 10NF-20+50%7X8R6000 CAPACITOR	CC 087.7525	
	VALVO 2222 63051 64051103		
C116	CC 10NF-20+50%7X8R6000 CAPACITOR	CC 087.7525	
	VALVO 2222 63051 64051103		
C117	CC 10NF-20+50%7X8R6000 CAPACITOR	CC 087.7525	
	VALVO 2222 63051 64051103		
C118	CC 1UF +-10% 50VK1200LR CAPACITOR	CC 092.1015	
	AEROVOX CKR06BX105KLEVELR		
C119	CC 1UF +-10% 50VK1200LR CAPACITOR	CC 092.1015	
	AEROVOX CKR06BX105KLEVELR		
C120	CC 1,5PF+-0,2PF63V3X3P100 CAPACITOR	CC 093.5795	
	DRALORIC EEFZ3X3 63V 1,5PF		
C121	CC 1,5PF+-0,25PF3X4P100 CAPACITOR	CC 087.6193	
	VALVO 2222 678 03158		
C123	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8185	
	ERO-TANTAL TA-ELKOETR1-1/35		
C124	CC 3,8PF+-0,25PF50V2NP0 CAPACITOR	CC 093.5620	
	VITRAMON VJ0805A3R8CFA		
C125	KONDENSATOR 0,6PF 2,5X2,8	093.5772	
C127	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8185	
	ERO-TANTAL TA-ELKOETR1-1/35		
C128	CC 1UF +-10% 50VK1200LR CAPACITOR	CC 092.1015	
	AEROVOX CKR06BX105KLEVELR		
C129	CC 1UF +-10% 50VK1200LR CAPACITOR	CC 092.1015	
	AEROVOX CKR06BX105KLEVELR		
C150	CC 15PF+-2%3X4NP0 CAPACITOR	CC 087.6441	
	VALVO 2222 678 10159		
C152	CC 560PF+-10%3X4R2000 CERAMIC CAPACITOR	CC 087.7002	
	VALVO 2222 63051 561		
C153	CE 10 UF+-20%16V 7X 4X 8	CE 022.8085	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR2-10/15		
C154	CC 2,7PF+-0,25PF3X4NP0 CERAMIC CAPACITOR VALVO 2222 678 09278	CC 087.6358	
C160	CC 1,8PF+-0,25PF3X4P100 CAPACITOR VALVO 2222 678 03188	CC 087.6206	
C161	CC 10PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09109	CC 087.6429	
C162	CC 56PF+-2%5X6NP0 CAPACITOR VALVO 2222 678 10569	CC 087.6512	
C165	CC 56PF+-2%5X6NP0 CAPACITOR VALVO 2222 678 10569	CC 087.6512	
C166	CC 56PF+-2%5X6NP0 CAPACITOR VALVO 2222 678 10569	CC 087.6512	
C170	CC 3,3PF+-5%50V NP0 CHIP CAPACITOR VITRAMON VJ0504A3R3CFA	CC 093.3240	
C171	CC 2,1PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJ0805A2R1CFA	CC 093.5550	
C172	CC 3,3PF+-5%50V NP0 CHIP CAPACITOR VITRAMON VJ0504A3R3CFA	CC 093.3240	
C173	CC 3PF+-0,25PF5NP0 CAPACITOR DRALORIC SE5,3/0,25 NP0	CC 022.4615	
C174	CC 3PF+-0,25PF5NP0 CAPACITOR DRALORIC SE5,3/0,25 NP0	CC 022.4615	
C175	CC 220PF+-10%63V3X5D2000 CAPACITOR VALVO 2222 63051 221	CC 099.5616	
C176	CC 2,3PF+-0,25PF50V2NP0 CAPACITOR VITRAMON VJ0805A2R3CFA	CC 093.5566	
C177	CC 1,0PF+-0,25PF50VNP0 CH CHIP CAPACITOR VITRAMON VJ0805A1R0CFA	CC 099.6770	
C178	KONDENSATOR 0,6PF 2,5X2,8	093.5772	
C179	KONDENSATOR 0,6PF 2,5X2,8	093.5772	
C180	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C181	CC 47PF+-2%5X6NP0 CAPACITOR VALVO 2222 678 10479	CC 087.6506	
C200	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C220			

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C221	CE 47UF -10+100%40V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-B7476-Z	CE 022.7589	
C222	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C223	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C224	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C225	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C226	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C227	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C228	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C229	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C230	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C231	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C232	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C233	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C234	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C235	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C236	CC 82PF+-2%6X7NP0 CAPACITOR VALVO 2222 678 10829	CC 087.6535	
C237	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C243			
C244	CC 47PF+-2%5X6NP0 CAPACITOR VALVO 2222 678 10479	CC 087.6506	
C245	CC 10NF-20+50%7X8R6000	CC 087.7525	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	CAPACITOR		
	VALVO 2222 63051 64051103		
C246	CC 47PF+-2%5X6NP0	CC 087.6506	
	CAPACITOR		
	VALVO 2222 678 10479		
C247	CC 47PF+-2%5X6NP0	CC 087.6506	
	CAPACITOR		
	VALVO 2222 678 10479		
C248	CC 47PF+-2%5X6NP0	CC 087.6506	
	CAPACITOR		
	VALVO 2222 678 10479		
C249	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C250	CC 10PF+-0,25PF3X4NP0	CC 087.6429	
	CAPACITOR		
	VALVO 2222 678 09109		
C251	CC 10PF+-0,25PF3X4NP0	CC 087.6429	
	CAPACITOR		
	VALVO 2222 678 09109		
C252	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C254	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C256	CC 47PF+-2%5X6NP0	CC 087.6506	
	CAPACITOR		
	VALVO 2222 678 10479		
C257	CC 120PF+-2%6X9NP0	CC 087.6558	
	CAPACITOR		
	VALVO 2222 678 10121		
C258	CC 47PF+-2%5X6NP0	CC 087.6506	
	CAPACITOR		
	VALVO 2222 678 10479		
C259	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C260	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C270	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C271	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C272	CC 10NF-20+50%7X8R6000	CC 087.7525	
	CAPACITOR		
	VALVO 2222 63051 64051103		
C282	CC 47PF+-2%5X6NP0	CC 087.6506	
	CAPACITOR		
	VALVO 2222 678 10479		
BIS/TO C286 C400 BIS/TO	ENTHALTEN IN/INCLUDED IN		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C403	342.5426		
C404	KONDENSATOR 0,6PF 2,5X2,8	093.5772	
C405	ENTHALTEN IN/INCLUDED IN 342.5426		
C406	ENTHALTEN IN/INCLUDED IN 342.5426		
C407	ENTHALTEN IN/INCLUDED IN 342.5426		
C408	KONDENSATOR 0,6PF 2,5X2,8	093.5772	
C409	ENTHALTEN IN/INCLUDED IN 342.5426		
C410	ENTHALTEN IN/INCLUDED IN 342.5426		
C411	CC 1,0PF+-0,1PF500V3X3X3P CAPACITOR ATC ATC100B1R0BP500X	CC 580.9579	
L1	LD 0,10UH10%0,080HM1,40CA CHOKE DELEVAN DROSSEL1025-94	LD 067.2740	
L2	LD 1,00UH10%1,000HM0,39CA CHOKE DELEVAN 1025-20	LD 067.2863	
L3	SPULE COIL	342.5455	
L4	SPULE COIL	342.6768	
L5	SPULE COIL	342.5449	
L6	SPULE COIL	342.5449	
L7	LD 1000UH10%72,00HM0,028A CHOKE DELEVAN DROSSEL1025-92	LD 037.8005	
L8	LD 1,00UH10%1,000HM0,39CA CHOKE DELEVAN 1025-20	LD 067.2863	
L9	LD 0,10 UH 10% 935 MIA CHOKE DELEVAN DROSSEL0819-00	LD 092.3030	
L10	LD 0,10 UH 10% 935 MIA CHOKE DELEVAN DROSSEL0819-00	LD 092.3030	
L12	LF ROHRKERN RD3,5XRD1,2XL TUBLAR CORE VALVO 431202031051	LF 026.9257	
L15	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L20	SPULE COIL	342.9680	
L21	SPULE COIL	342.9680	
L22	SPULE COIL	342.5478	
L23	SPULE	342.9680	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	COIL		
L24	SPULE	342.9680	
	COIL		
L25	SPULE	342.5478	
	COIL		
L26	SPULE	342.5478	
	COIL		
L27	SPULE	342.5478	
	COIL		
L30	SPULE	342.5449	
	COIL		
L31	SPULE	342.5449	
	COIL		
L32	LD 0,03UH/85PF Q100	343.0128	
	COIL WITH ALU-CORE		
	TOCO 301-AS-0100		
L33	LD 0,064UH/33,7PF Q85	303.9030	
	COMPONEX 301AN-0300		
L34	LD 0,064UH/33,7PF Q85	303.9030	
	COMPONEX 301AN-0300		
L35	LD 0,064UH/33,7PF Q85	303.9030	
	COMPONEX 301AN-0300		
L36	LD 0,03UH/85PF Q100	343.0128	
	COIL WITH ALU-CORE		
	TOCO 301-AS-0100		
L37	LD 0,10UH10%0,080HM1,400A	LD 067.2740	
	CHOKE		
	DELEVAN DROSSEL1025-94		
L38	LD 0,10UH10%0,080HM1,400A	LD 067.2740	
	CHOKE		
	DELEVAN DROSSEL1025-94		
L39	LD 0,10UH10%0,080HM1,400A	LD 067.2740	
	CHOKE		
	DELEVAN DROSSEL1025-94		
L40	LD 0,10UH10%0,080HM1,400A	LD 067.2740	
	CHOKE		
	DELEVAN DROSSEL1025-94		
L41	LD 0,10UH10%0,080HM1,400A	LD 067.2740	
	CHOKE		
	DELEVAN DROSSEL1025-94		
L42	SPULE	343.0463	
L43	SPULE	343.0463	
L44	LD 0,10UH10%0,080HM1,400A	LD 067.2740	
	CHOKE		
	DELEVAN DROSSEL1025-94		
L45	SPULE	342.9844	
	COIL		
L46	SPULE	342.9844	
	COIL		
L47	SPULE	342.9838	
	COIL		
L49	SPULE	343.0463	
L50	LD 1000UH10%72,00HM0,028A	LD 037.8005	
	CHOKE		
	DELEVAN DROSSEL1025-92		
L51	LD 0,15UH10%0,100HM1,230A	LD 067.2763	
	CHOKE		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DELEVAN DROSSEL1025-00		
L52	LD 100 UH10%8,000HM0,084A CHOKE	LD 067.3101	
	DELEVAN DROSSEL1025-68		
L53	LD 1000UH10%72,00HM0,028A CHOKE	LD 037.8005	
	DELEVAN DROSSEL1025-92		
L54	LD 1000UH10%72,00HM0,028A CHOKE	LD 037.8005	
	DELEVAN DROSSEL1025-92		
L60	SPULE COIL	342.5432	
L61	SPULE COIL	342.5432	
L62	SPULE COIL	342.5478	
L63	SPULE COIL	342.5432	
L64	SPULE COIL	342.5432	
L65	SPULE COIL	342.5478	
L66	SPULE COIL	342.5478	
L67	SPULE COIL	342.5478	
L100	LD 10,0UH10%3,300HM0,144A CHOKE	LD 026.4184	
	DELEVAN DROSSEL1025-44		
BIS/TO L104			
L105	LD 5,60UH10%1,800HM0,195A CHOKE	LD 067.2957	
	DELEVAN DROSSEL1025-38		
BIS/TO L113			
L114	LD 5,6 UH 10% 138 MIA CHOKE	LD 092.3247	
	DELEVAN DROSSEL0819-42		
L115	LD 5,60UH10%1,800HM0,195A CHOKE	LD 067.2957	
	DELEVAN DROSSEL1025-38		
L116	LD 5,60UH10%1,800HM0,195A CHOKE	LD 067.2957	
	DELEVAN DROSSEL1025-38		
L117	LD 5,6 UH 10% 138 MIA CHOKE	LD 092.3247	
	DELEVAN DROSSEL0819-42		
L118	LD 5,60UH10%1,800HM0,195A CHOKE	LD 067.2957	
	DELEVAN DROSSEL1025-38		
L119	LD 1,20UH10%0,180HM0,620A CHOKE	LD 067.2870	
	DELEVAN DROSSEL1025-22		
L120	LD 1,00UH10%1,000HM0,390A CHOKE	LD 067.2863	
	DELEVAN 1025-20		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L121	LD 6,80UH10%2,000HM0,185A CHOKE DELEVAN DROSSEL1025-40	LD 026.4178	
L122	LD 5,60UH10%1,800HM0,195A CHOKE DELEVAN DROSSEL1025-38	LD 067.2957	
L125	LD 6,80UH10%2,000HM0,185A CHOKE DELEVAN DROSSEL1025-40	LD 026.4178	
L126	LD 6,80UH10%2,000HM0,185A CHOKE DELEVAN DROSSEL1025-40	LD 026.4178	
L127	LD 4,70UH10%1,200HM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L129	LD 0,10UH10%0,080HM1,400A CHOKE DELEVAN DROSSEL1025-94	LD 067.2740	
L140	LD 1,00UH10%1,000HM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L141	LD 1,00UH10%1,000HM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L142	LD 1,00UH10%1,000HM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L143	LD 1,00UH10%1,000HM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L144	LD 100 UH10%8,000HM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L145	LD 100 UH10%8,000HM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L160	SPULE COIL	342.9850	
L161	SPULE COIL	342.9850	
L162	SPULE COIL	342.9867	
N1	BM TFM-2 MIXER 1-1000MHZ IC MIXER TFM-2 MCL TFM-2	BM 302.6080	
N2	BM TFM-2 MIXER 1-1000MHZ IC MIXER TFM-2 MCL TFM-2	BM 302.6080	
N3	BO UA734C KOMPARATOR IC COMPARATOR UA734C FAIRCHILD UA734DC	BO 243.3561	
N4	BO LF355N BIFET.OP-AMP. IC OPERATION AMPLIFIER LF NSC LF355N	BO 092.8161	
N5	BM HPF-505 RINGMISCHER IC RING MIXER HPF-505	BM 303.8928	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	MCL HPF-505		
N6	BO SE5534AFE OP-AMP. IC OP.AMPLIFIER SA5534AFE SIGNETICS SE5534AFE	BO 301.3335	
N7	BO SE5534AFE OP-AMP. IC OP.AMPLIFIER SA5534AFE SIGNETICS SE5534AFE	BO 301.3335	
N8	BL CD4515BD 10F16 DECOD DECODER RCA CD4515BD	BL 517.7620	
N9	BL MC14560BCP NBCD-ADDER NBCD ADDER MOTOROLA MC14560BCP	BL 303.9099	
P1	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
P2	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
R1	RL 0,25W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R2	RL 0,25W 5,62KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,62K-F-C	RL 082.2190	
R3	RL 0,25W 1,21KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,21K-F-D	RL 083.0655	
R4	RL 0,25W 121 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/121OHM-F-D	RL 082.9859	
R5	RL 0,25W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R7	RL 0,13W 47 OHM2% UNGEW. RESISTOR RESISTA MK1 47OHM 2% UNGEW.	RL 092.5910	
R8	RL 0,25W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R9	RL 0,25W 475 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/475K-F-C	RL 083.2593	
R10	RL 0,25W 475 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/475K-F-C	RL 083.2593	
R11	RL 0,25W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R12	RL 0,25W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R13	RL 0,25W 8,25KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/8,25K-F-D	RL 083.1239	
R14	RL 0,25W 332 OHM+-1%TK50 RESISTOR	RL 083.0255	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DRALORIC SMA0207/3320HM-F-D		
R15	RL 0,25W 15,0KOHM+-1%TK50	RL 083.1400	
	RESISTOR		
	DRALORIC SMA0207/15K-F-D		
R16	RL 0,13W 10,0 OHM+-1%TK50	RL 092.1715	
	RESISTOR		
	RESISTA MK1 10,00HM 1% TK50		
R17	RL 0,25W 2,67KOHM+-1%TK50	RL 083.0910	
	RESISTOR		
	DRALORIC SMA0207/2,67K-F-D		
R18	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R19	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R20	RL 0,25W 221 OHM+-1%TK50	RL 083.0084	
	RESISTOR		
	DRALORIC SMA0207/2210HM-F-D		
R21	RL 0,25W 22,1KOHM+-1%TK50	RL 083.1545	
	RESISTOR		
	DRALORIC SMA/207/22,1K-F-C		
R22	RF 0-WIDERSTAND DIN 0207	RF 069.0000	
	0-RESISTOR		
	RESISTA SK2,0 OHM		
R23	RL 0,25W 39,2 OHM+-1%TK50	RL 082.9420	
	RESISTOR		
	DRALORIC SMA0207/39,20HM-F-D		
R24	RL 0,25W 33,2KOHM+-1%TK50	RL 083.1674	
	RESISTOR		
	DRALORIC SMA0207/33,2K-F-C		
R25	RL 0,25W 100 OHM+-1%TK50	RL 082.6543	
	DEPOS.-CARBON RESISTOR		
	DRALORIC SMA0207/100/HM-F-D		
R26	RL 0,25W 5,62KOHM+-1%TK50	RL 082.2190	
	RESISTOR		
	DRALORIC SMA0207/5,62K-F-C		
R27	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R28	RL 0,25W 56,2KOHM+-1%TK50	RL 082.2231	
	RESISTOR		
	DRALORIC SMA0207/56,2K-F-C		
R29	RL 0,25W 475 OHM+-1%TK50	RL 083.0390	
	RESISTOR		
	DRALORIC SMA0207/4750HM-F-D		
R30	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R31	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R32	RL 0,25W 301 OHM+-1%TK50	RL 083.0210	
	RESISTOR		
	DRALORIC SMA0207/3010HM-F-D		
R33	RL 0,25W 47,5KOHM+-1%TK50	RL 083.1800	
	RESISTOR		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DRALORIC SMA/207/47,5K-F-C		
R34	RL 0,25W 33,2KOHM+-1%TK50 RESISTOR	RL 083.1674	
	DRALORIC SMA0207/33,2K-F-C		
R35	RL 0,13W 10,0KOHM+-1%TK50 RESISTOR	RL 092.1567	
	RESISTA MK1 10KO 1% TK50		
R36	RL 0,25W 475 OHM+-1%TK50 RESISTOR	RL 083.0390	
	DRALORIC SMA0207/475OHM-F-D		
R37	RL 0,25W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	
	DRALORIC SMA0207/100K-F-C		
R38	RL 0,13W 56 OHM2% UNGEW. RESISTOR	RL 092.5927	
	RESISTA MK1 56OHM 2% UNGEW.		
R39	RL 0,13W 100 OHM2% UNGEW. RESISTOR	RL 092.5956	
	RESISTA MK1 1000HM 2% UNGEW.		
R40	RL 0,25W 68,1 OHM+-1%TK50 RESISTOR	RL 082.9636	
	DRALORIC SMA0207/68,1OHM-F-D		
R41	RL 0,13W 56,2 OHM+-1%TK50 RESISTOR	RL 092.1280	
	RESISTA MK1 56,2OHM 1% TK50		
R43	RL 0,13W 47,5 OHM+-1%TK50 RESISTOR	RL 092.1267	
	RESISTA MK1 47,5OHM 1% TK50		
R44	RL 0,25W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	
	DRALORIC SMA0207/1K-F-C		
R45	RL 0,13W 47,5 OHM+-1%TK50 RESISTOR	RL 092.1267	
	RESISTA MK1 47,5OHM 1% TK50		
R46	RL 0,25W 2,74KOHM+-1%TK50 RESISTOR	RL 083.0926	
	DRALORIC SMA0207/2,74K-F-D		
R47	RL 0,13W 10,0KOHM+-1%TK50 RESISTOR	RL 092.1567	
	RESISTA MK1 10KO 1% TK50		
R48	RL 0,13W 24,3 OHM+-1%TK50 RESISTOR	RL 092.0054	
R49	RL 0,25W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	
	DRALORIC SMA0207/10K-F-D		
R50	RL 0,13W 1,00KOHM+-1%TK50 RESISTOR	RL 092.1444	
	RESISTA MK1 1KOO 1% TK50		
R51	RL 0,13W 47,5 OHM+-1%TK50 RESISTOR	RL 092.1267	
	RESISTA MK1 47,5OHM 1% TK50		
R52	RL 0,13W 10,0KOHM+-1%TK50 RESISTOR	RL 092.1567	
	RESISTA MK1 10KO 1% TK50		
R53	RL 0,13W 2,74KOHM+-1%TK50 RESISTOR	RL 092.1496	
	RESISTA MK1 2K74 1% TK50		

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R54	RL 0,13W 33,2 OHM+-1%TK50 RESISTOR RESISTA MK1 33,20HM 1% TK50	RL 092.1244	
R55	RL 0,25W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R56	RL 0,25W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R57	RL 0,25W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMAC207/10K-F-D	RL 083.1297	
R58	RL 0,13W 47,5 OHM+-1%TK50 RESISTOR RESISTA MK1 47,50HM 1% TK50	RL 092.1267	
R59	RL 0,25W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R60	RL 0,25W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R61	RL 0,13W 1,0KOHM2% UNGEW. RESISTOR RESISTA MK1 1K 2% UNGEW.	RL 092.6075	
R62	RL 0,13W 1,0KOHM2% UNGEW. RESISTOR RESISTA MK1 1K 2% UNGEW.	RL 092.6075	
R63	RL 0,13W 1,0KOHM2% UNGEW. RESISTOR RESISTA MK1 1K 2% UNGEW.	RL 092.6075	
R64	RL 0,13W 1,0KOHM2% UNGEW. RESISTOR RESISTA MK1 1K 2% UNGEW.	RL 092.6075	
R65	RL 0,13W 100 KOHM+-1%TK50 RESISTOR RESISTA MK1 100K 10% TK50	RL 092.1680	
R66	RL 0,13W 100 KOHM+-1%TK50 RESISTOR RESISTA MK1 100K 10% TK50	RL 092.1680	
R67	RL 0,13W 100 KOHM+-1%TK50 RESISTOR RESISTA MK1 100K 10% TK50	RL 092.1680	
R71	RL 0,25W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R72	RL 0,25W 432 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/4320HM-F-D	RL 083.0355	
R73	RL 0,25W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/6810HM-F-D	RL 083.0490	
R74	RL 0,25W 274 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/2740HM-F-D	RL 083.0178	
R75	RL 0,25W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/4750HM-F-D	RL 083.0390	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R76	RL 0,25W 604 OHM+-1%TK50	RL 082.2425	
	RESISTOR		
	DRALORIC SMA/207/6040HM-F-C		
R77	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R79	RL 0,25W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
BIS/TO R97			
R104	RL 0,13W 18 OHM2% UNGEW.	RL 092.5862	
	RESISTOR		
	RESISTA MK1 180HM 2% UNGEW.		
R105	RL 0,25W 274 OHM+-1%TK50	RL 083.0178	
	RESISTOR		
	DRALORIC SMA0207/2740HM-F-D		
R106	RL 0,13W 47 OHM2% UNGEW.	RL 092.5910	
	RESISTOR		
	RESISTA MK1 470HM 2% UNGEW.		
R107	RL 0,13W 56 OHM2% UNGEW.	RL 092.5927	
	RESISTOR		
	RESISTA MK1 560HM 2% UNGEW.		
R111	RL 0,13W 47,5KOHM+-1%TK50	RL 092.1644	
	RESISTOR		
	RESISTA MK1 47K5 1% TK50		
R112	RL 0,13W 27,4KOHM+-1%TK50	RL 092.1615	
	RESISTOR		
	RESISTA MK1 27K4 1% TK50		
R113	RL 0,13W 1,00KOHM+-1%TK50	RL 092.1444	
	RESISTOR		
	RESISTA MK1 1K00 1% TK50		
R114	RL 0,25W27,40 OHM+-1%TK50	RL 082.9271	
	RESISTOR		
	DRALORIC SMA0207/27,40HM-F-D		
R115	RL 0,13W 392 OHM+-1%TK50	RL 092.1396	
	RESISTOR		
	RESISTA MK1 3920HM 1% TK50		
R118	RL 0,13W 56,2KOHM+-1%TK50	RL 092.1650	
	RESISTOR		
	RESISTA MK1 56K20 1% TK50		
R119	RL 0,13W 27,4KOHM+-1%TK50	RL 092.1615	
	RESISTOR		
	RESISTA MK1 27K4 1% TK50		
R120	RL 0,13W 82 OHM2% UNGEW.	RL 092.5940	
	RESISTOR		
	RESISTA MK1 820HM 2% UNGEW.		
R121	RL 0,25W 274 OHM+-1%TK50	RL 083.0178	
	RESISTOR		
	DRALORIC SMA0207/2740HM-F-D		
R122	RL 0,13W 270 OHM2% UNGEW.	RL 092.6000	
	RESISTOR		
	RESISTA MK1 2700HM 2% UNGEW.		
R123	RL 0,13W 18 OHM2% UNGEW.	RL 092.5862	
	RESISTOR		
	RESISTA MK1 180HM 2% UNGEW.		
R124	RL 0,13W 270 OHM2% UNGEW.	RL 092.6000	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	RESISTOR		
	RESISTA MK1 2700HM 2% UNGEW.		
R125	RL 0,13W 68 OHM2% UNGEW.	RL 092.5933	
	RESISTOR		
	RESISTA MK1 680HM 2% UNGEW.		
R126	RL 0,13W 100 OHM2% UNGEW.	RL 092.5956	
	RESISTOR		
	RESISTA MK1 1000HM 2% UNGEW.		
R127	RL 0,13W 68 OHM2% UNGEW.	RL 092.5933	
	RESISTOR		
	RESISTA MK1 680HM 2% UNGEW.		
R128	RL 0,25W 182 OHM+-1%TK50	RL 083.0010	
	RESISTOR		
	DRALORIC SMA0207/182OHM-F-D		
R129	RL 0,25W 12,1KOHM+-1%TK50	RL 083.1351	
	RESISTOR		
	DRALORIC SMA0207/12,1K-F-D		
R130	RL 0,25W 22,1KOHM+-1%TK50	RL 083.1545	
	RESISTOR		
	DRALORIC SMA/207/22,1K-F-C		
R131	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R132	RL 0,25W 475 OHM+-1%TK50	RL 083.0390	
	RESISTOR		
	DRALORIC SMA0207/475OHM-F-D		
R133	RL 0,13W 10,0KOHM+-1%TK50	RL 092.1567	
	RESISTOR		
	RESISTA MK1 10K0 1% TK50		
R134	RL 0,13W 22,1KOHM+-1%TK50	RL 092.1609	
	RESISTOR		
	RESISTA MK1 22K1 1% TK50		
R135	RL 0,13W 100 OHM2% UNGEW.	RL 092.5956	
	RESISTOR		
	RESISTA MK1 1000HM 2% UNGEW.		
R136	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R137	RL 0,13W 56,2 OHM+-1%TK50	RL 092.1280	
	RESISTOR		
	RESISTA MK1 56,2OHM 1% TK50		
R138	RL 0,13W 100 OHM+-1%TK50	RL 092.1321	
	DEPOS.-CARBON RESISTOR		
	RESISTA MK1 100OHM 1% TK50		
R139	RL 0,13W 100 OHM+-1%TK50	RL 092.1321	
	DEPOS.-CARBON RESISTOR		
	RESISTA MK1 100OHM 1% TK50		
R140	RL 0,13W 100 OHM2% UNGEW.	RL 092.5956	
	RESISTOR		
	RESISTA MK1 100OHM 2% UNGEW.		
R141	RL 0,13W 56 OHM2% UNGEW.	RL 092.5927	
	RESISTOR		
	RESISTA MK1 560HM 2% UNGEW.		
R142	RL 0,25W 47,5 OHM+-1%TK50	RL 082.9507	
	RESISTOR		
	DRALORIC SMA0207/47,5OHM-F-D		
R143	RL 0,25W 12,1KOHM+-1%TK50	RL 083.1351	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	RESISTOR		
	DRALORIC SMA0207/12,1K-F-D		
R144	RL 0,25W 22,1KOHM+-1%TK50	RL 083.1545	
	RESISTOR		
	DRALORIC SMA/207/22,1K-F-C		
R145	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R146	RL 0,25W 75,0 OHM+-1%TK50	RL 082.9665	
	RESISTOR		
	DRALORIC SMA0207/750HM-F-D		
R147	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R148	RL 0,25W 22,1KOHM+-1%TK50	RL 083.1545	
	RESISTOR		
	DRALORIC SMA/207/22,1K-F-C		
R149	RL 0,13W 100 OHM2% UNGEW.	RL 092.5956	
	RESISTOR		
	RESISTA MK1 100OHM 2% UNGEW.		
R150	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R151	RL 0,13W 330 OHM2% UNGEW.	RL 092.6017	
	RESISTOR		
	RESISTA MK1 3300HM 2% UNGEW.		
R152	RL 0,13W 18 OHM2% UNGEW.	RL 092.5862	
	RESISTOR		
	RESISTA MK1 180HM 2% UNGEW.		
R153	RL 0,13W 100 KOHM+-1%TK50	RL 092.1680	
	RESISTOR		
	RESISTA MK1 100K 10% TK50		
R154	RL 0,25W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
R155	RL 0,25W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
R156	RL 0,13W 100 KOHM+-1%TK50	RL 092.1680	
	RESISTOR		
	RESISTA MK1 100K 10% TK50		
R157	RL 0,25W 475 OHM+-1%TK50	RL 083.0390	
	RESISTOR		
	DRALORIC SMA0207/4750HM-F-D		
R159	RL 0,25W 33,2 OHM+-1%TK50	RL 082.9359	
	RESISTOR		
	DRALORIC SMA0207/33,20HM-F-D		
R161	RL 0,13W 5,62KOHM+-1%TK50	RL 092.1538	
	RESISTOR		
	RESISTA MK1 5K62 1% TK50		
R162	RL 0,13W 33,2KOHM+-1%TK50	RL 092.1621	
	RESISTOR		
	RESISTA MK1 33K2 1% TK50		
R163	RL 0,13W 10,0KOHM+-1%TK50	RL 092.1567	
	RESISTOR		
	RESISTA MK1 10K0 1% TK50		
R164	RL 0,13W 100 OHM+-1%TK50	RL 092.1321	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DEPOS.-CARBON RESISTOR		
	RESISTA MK1 1000HM 1% TK50		
R165	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R166	RL 0,25W 22,1KOHM+-1%TK50	RL 083.1545	
	RESISTOR		
	DRALORIC SMA/207/22,1K-F-C		
R167	RL 0,25W 681 OHM+-1%TK50	RL 083.0490	
	RESISTOR		
	DRALORIC SMA0207/6810HM-F-D		
R168	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R169	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R170	RL 0,25W 47,5KOHM+-1%TK50	RL 083.1800	
	RESISTOR		
	DRALORIC SMA/207/47,5K-F-C		
R171	RL 0,25W 475 KOHM+-1%TK50	RL 083.2593	
	RESISTOR		
	DRALORIC SMA/207/475K-F-C		
R172	RL 0,25W 475 KOHM+-1%TK50	RL 083.2593	
	RESISTOR		
	DRALORIC SMA/207/475K-F-C		
R173	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R174	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R175	RL 0,25W 8,25KOHM+-1%TK50	RL 083.1239	
	RESISTOR		
	DRALORIC SMA0207/8,25K-F-D		
R176	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R177	RL 0,25W 2,21KOHM+-1%TK50	RL 082.2477	
	RESISTOR		
	DRALORIC SMA 0207/2,21K-F-C		
R178	RL 0,25W 10,0 OHM+-1%TK50	RL 082.8852	
	RESISTOR		
	DRALORIC SMA0207/10OHM-F-D		
R179	RL 0,25W 4,75KOHM+-1%TK50	RL 083.1097	
	RESISTOR		
	DRALORIC SMA0207/4,75K-F-D		
R180	RL 0,25W 332 OHM+-1%TK50	RL 083.0255	
	RESISTOR		
	DRALORIC SMA0207/332OHM-F-D		
R181	RL 0,25W 18,2KOHM+-1%TK50	RL 083.1480	
	RESISTOR		
	DRALORIC SMA/207/18,2K-F-C		
R182	RL 0,25W 221 OHM+-1%TK50	RL 083.0084	
	RESISTOR		
	DRALORIC SMA0207/221OHM-F-D		
R183	RL 0,25W 1,78KOHM+-1%TK50	RL 082.6643	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	RESISTOR		
	DRALORIC SMA0207/1,78K-F-D		
R184	RL 0,25W 2,21KOHM+-1%TK50	RL 082.2477	
	RESISTOR		
	DRALORIC SMA 0207/2,21K-F-C		
R185	RL 0,25W 1,33KOHM+-1%TK50	RL 083.0684	
	RESISTOR		
	DRALORIC SMA0207/1,33K-F-D		
R186	RL 0,25W 1,82KOHM+-1%TK50	RL 082.2277	
	RESISTOR		
	DRALORIC SMA0207/1,82K-F-C		
R187	RL 0,25W 1,82KOHM+-1%TK50	RL 082.2277	
	RESISTOR		
	DRALORIC SMA0207/1,82K-F-C		
R188	RL 0,25W 2,21KOHM+-1%TK50	RL 082.2477	
	RESISTOR		
	DRALORIC SMA 0207/2,21K-F-C		
R189	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R190	RL 0,25W 1,74KOHM+-1%TK50	RL 083.0784	
	RESISTOR		
	DRALORIC SMA0207/1,74K-F-D		
R191	RL 0,25W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
BIS/TO R198			
R207	RL 0,13W 1,0KOHM2% UNGEW.	RL 092.6075	
	RESISTOR		
	RESISTA MK1 1K 2% UNGEW.		
R208	RL 0,25W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
R209	RL 0,25W 4,75KOHM+-1%TK50	RL 083.1097	
	RESISTOR		
	DRALORIC SMA0207/4,75K-F-D		
R210	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R211	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R212	RL 0,25W 2,74KOHM+-1%TK50	RL 083.0926	
	RESISTOR		
	DRALORIC SMA0207/2,74K-F-D		
R213	RL 0,13W 2,21KOHM+-1%TK50	RL 092.1480	
	RESISTOR		
	RESISTA MK1 2K21 1% TK50		
R214	RL 0,13W 33,2 OHM+-1%TK50	RL 092.1244	
	RESISTOR		
	RESISTA MK1 33,2OHM 1% TK50		
R215	RL 0,25W 4,75KOHM+-1%TK50	RL 083.1097	
	RESISTOR		
	DRALORIC SMA0207/4,75K-F-D		
R216	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DRALORIC SMA0207/10K-F-D		
R217	RL 0,13W 1,0KOHM2% UNGEW.	RL 092.6075	
	RESISTOR		
	RESISTA MK1 1K 2% UNGEW.		
R218	RL 0,25W 2,74KOHM+-1%TK50	RL 083.0926	
	RESISTOR		
	DRALORIC SMA0207/2,74K-F-D		
R219	RL 0,13W 2,21KOHM+-1%TK50	RL 092.1480	
	RESISTOR		
	RESISTA MK1 2K21 1% TK50		
R220	RL 0,13W 68 OHM2% UNGEW.	RL 092.5933	
	RESISTOR		
	RESISTA MK1 680HM 2% UNGEW.		
R222	RL 0,13W 47,5 OHM+-1%TK50	RL 092.1267	
	RESISTOR		
	RESISTA MK1 47,5OHM 1% TK50		
R237	RL 0,25W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
R238	RL 0,13W 56 OHM2% UNGEW.	RL 092.5927	
	RESISTOR		
	RESISTA MK1 560HM 2% UNGEW.		
R239	RL 0,21W. 10 OHM2% UNGEW.	RL 092.5833	
	RESISTOR		
	RESISTA MK1 100HM 2% UNGEW.		
R240	RL 0,25W 100KOHM+-1%TK50	RL 082.1764	
	RESISTOR		
	DRALORIC SMA0207/100K-F-C		
R241	RL 0,25W 2,21KOHM+-1%TK50	RL 082.2477	
	RESISTOR		
	DRALORIC SMA 0207/2,21K-F-C		
R242	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		
	DRALORIC SMA0207/10K-F-D		
R243	RL 0,25W 1,82KOHM+-1%TK50	RL 082.2277	
	RESISTOR		
	DRALORIC SMA0207/1,82K-F-C		
R244	RL 0,25W 221 OHM+-1%TK50	RL 083.0084	
	RESISTOR		
	DRALORIC SMA0207/2210HM-F-D		
R245	RL 0,25W22,10 OHM+-1%TK50	RL 082.9188	
	RESISTOR		
	DRALORIC SMA0207/22,10HM-F-D		
R246	RL 0,13W 220 OHM2% UNGEW.	RL 092.5991	
	RESISTOR		
	RESISTA MK1 2200HM 2% UNGEW.		
R247	RL 0,25W 475 OHM+-1%TK50	RL 083.0390	
	RESISTOR		
	DRALORIC SMA0207/4750HM-F-D		
R248	RL 0,25W 47,5KOHM+-1%TK50	RL 083.1800	
	RESISTOR		
	DRALORIC SMA/207/47,5K-F-C		
R249	RL 0,25W 33,2KOHM+-1%TK50	RL 083.1674	
	RESISTOR		
	DRALORIC SMA0207/33,2K-F-C		
R250	RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297	
	RESISTOR		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DRALORIC SMA0207/10K-F-D		
R301	RL 0,25W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	
	DRALORIC SMA0207/10K-F-D		
BIS/TO R309			
R425	RL 0,13W 68 OHM2% UNGEW. RESISTOR	RL 092.5933	
	RESISTA MK1 680HM 2% UNGEW.		
R426	RL 0,13W 100 OHM2% UNGEW. RESISTOR	RL 092.5956	
	RESISTA MK1 100OHM 2% UNGEW.		
R427	RL 0,13W 68 OHM2% UNGEW. RESISTOR	RL 092.5933	
	RESISTA MK1 680HM 2% UNGEW.		
R441	RL 0,13W 150 OHM+-1%TK50 RESISTOR	RL 092.1344	
	RESISTA MK1 1500HM 1% TK50		
	TRIMMWERT		
R900	RS 0,5W50KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7910	
	BOURNS 3386F-1-503		
R903	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7890	
	BOURNS 3386F-1-502		
R904	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 087.7560	
	BOURNS 3386F-1-102		
R905	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7884	
	BOURNS 3386F-1-202		
R906	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 087.7560	
	BOURNS 3386F-1-102		
R907	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 087.7560	
	BOURNS 3386F-1-102		
R908	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7884	
	BOURNS 3386F-1-202		
R909	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7890	
	BOURNS 3386F-1-502		
R910	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7890	
	BOURNS 3386F-1-502		
R911	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7890	
	BOURNS 3386F-1-502		
R912	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7884	
	BOURNS 3386F-1-202		
R913	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7884	
	BOURNS 3386F-1-202		
R914	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7890	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	BOURNS 3386F-1-502		
R915	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-502	RS 247.7890	
R916	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-202	RS 247.7884	
R917	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-202	RS 247.7884	
T1	UEBERTRAGER TRANSFORMER	303.9499	
T2	UEBERTRAGER TRANSFORMER	303.9499	
V1	AK BFY90 NPN 15V 25MA TRANSISTOR VALVO BFY90	AK 010.4550	
V2	AE 5082-0180 50V STEPR.DI DIODE HEWLETT-P. 5082-0180	AE 012.9443	
V3	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V4	AM BF247A NKAN 25V FET FET TEXAS BF247A	AM 247.6536	
V5	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
BIS/TO V10			
V11	AK BFT66 NPN 20V 30MA TRANSISTOR SIEMENS BFT66	AK 252.5728	
V13	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	
V14	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V15	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V16	AK BFR90 NPN 15V 5GHZ TRANSISTOR VALVO BFR90	AK 236.9139	
V17	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V18	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V19	AM BF245A NKAN 30V FET FET TEXAS BF245A	AM 010.8527	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V20	AE BA379 25V PINDI DIODE BA379 SIEMENS BA379	AE 244.7031	
V21	AE BA379 25V PINDI DIODE BA379 SIEMENS BA379	AE 244.7031	
V22	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V23	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V24	AK BFR96 NPN 20V 5GHZ TRANSISTOR VALVO BFR96	AK 093.2738	
V25	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V26	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V27	AE BA379 25V PINDI DIODE BA379 SIEMENS BA379	AE 244.7031	
V28	AE BA379 25V PINDI DIODE BA379 SIEMENS BA379	AE 244.7031	
V29	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V30	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V31	AK BFR96 NPN 20V 5GHZ TRANSISTOR VALVO BFR96	AK 093.2738	
V32	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V33	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V34	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V35	AK BFR90 NPN 15V 5GHZ TRANSISTOR VALVO BFR90	AK 236.9139	
V50	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V52	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
BIS/TO V58 V60	AK 2N2907A PNP 60V 600MA	AK 010.3583	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	TRANSISTOR		
	VALVO 2N2907A		
V61	AK BFR90 NPN 15V 5GHZ	AK 236.9139	
	TRANSISTOR		
	VALVO BFR90		
V62	AK 2N2907A PNP 60V 600MA	AK 010.3583	
	TRANSISTOR		
	VALVO 2N2907A		
V63	AK BFR90 NPN 15V 5GHZ	AK 236.9139	
	TRANSISTOR		
	VALVO BFR90		
V64	AK 2N2907A PNP 60V 600MA	AK 010.3583	
	TRANSISTOR		
	VALVO 2N2907A		
V65	AK NE02135 NPN 12V 5GHZ	300.6147	
	TRANSISTOR		
	NEC NE02135		
V66	AK 2N2907A PNP 60V 600MA	AK 010.3583	
	TRANSISTOR		
	VALVO 2N2907A		
V67	AK BFR90 NPN 15V 5GHZ	AK 236.9139	
	TRANSISTOR		
	VALVO BFR90		
V68	AK 2N2907A PNP 60V 600MA	AK 010.3583	
	TRANSISTOR		
	VALVO 2N2907A		
V69	AK BFR96 NPN 20V 5GHZ	AK 093.2738	
	TRANSISTOR		
	VALVO BFR96		
V70	AK 2N2907A PNP 60V 600MA	AK 010.3583	
	TRANSISTOR		
	VALVO 2N2907A		
V71	AK NE02135 NPN 12V 5GHZ	300.6147	
	TRANSISTOR		
	NEC NE02135		
V79	AK BFT66 NPN 20V 30MA	AK 252.5728	
	TRANSISTOR		
	SIEMENS BFT66		
V80	AK 2N2222A NPN 40V 800MA	AK 010.5405	
	TRANSISTOR		
	VALVO 2N2222A		
V82	AE 5082-2800 SCHOTTKYDI	AE 012.9066	
	DIODE		
	HEWLETT-P. 5082-2800		
V83	AK 2N2222A NPN 40V 800MA	AK 010.5405	
	TRANSISTOR		
	VALVO 2N2222A		
V84	AM BF247A NKAN 25V FET	AM 247.6536	
	FET		
	TEXAS BF247A		
V85	AK 2N2222A NPN 40V 800MA	AK 010.5405	
	TRANSISTOR		
	VALVO 2N2222A		
V86	AD 1N4531 75V 0,15A UDI	AD 082.6514	
	DIODE		
	UNITRODE 1N4531		
BIS/TO			

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V91			
V92	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
BIS/TO			
V99			
V100	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V101	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V102	AK BFR96 NPN 20V 5GHZ TRANSISTOR VALVO BFR96	AK 093.2738	
V103	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V104	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V105	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V106	AK BFR96 NPN 20V 5GHZ TRANSISTOR VALVO BFR96	AK 093.2738	
V107	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V108	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
BIS/TO			
V115			
V116	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V117	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V120	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V130	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
BIS/TO			
V137			
V138	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V139	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V200	AD 1N4531 75V 0,15A UDI DIODE	AD 082.6514	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	UNITRODE 1N4531		
BIS/TO V220			
V230	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V231	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V232	AM BF245A NKAN 30V FET FET TEXAS BF245A	AM 010.8527	
W1	HF-KABEL W1 RF CABLE W1	342.5810	
W2	HF-KABEL W2 RF CABLE W2	342.9696	
X13	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X14	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X21	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X22	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X23	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X24	FP KURZSCHL.BUCHSE OFFEN SHORTING LINK BERG 76264-101	FP 342.1895	
X25	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
BIS/TO X28			
X30	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X31	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X32	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X33	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X34	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X41	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
BIS/TO			
X43			
X44	FP KURZSCHL.BUCHSE OFFEN SHORTING LINK BERG 76264-101	FP 342.1895	
X45	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
BIS/TO			
X48			
X50	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X51	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X52	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X53	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X54	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X151	FP STECKERL.INDIR.64POLIG 64-PIN INSERT ERNI STV-P-264 9722.333.	FP 084.6470	
X152	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIALL R 112 669	FJ 249.9684	
X153	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIALL R 112 669	FJ 249.9684	
X155	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIALL R 112 669	FJ 249.9684	
X156	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIALL R 112 669	FJ 249.9684	
X1/A	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X1/B	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X10/A	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X10/B	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X11/A	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X11/B	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X12/A	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X12/B	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X15/A	VL WIRE-WRAP PIN	VL 088.4507	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	BERG NR. 75 403-001		
X15/B	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X2/A	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X2/B	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X3/A	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X3/B	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X4/A	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X4/B	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X5/A	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X5/B	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X6/A	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X6/B	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X7/A	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X7/B	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X8/A	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X8/B	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X9/A	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
X9/B	VL WIRE-WRAP PIN	VL 088.4507	
	BERG NR. 75 403-001		
			- ENDE -

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X153
100 MHz
Eing.
input

X152
Spektral Ausgang
Spectrum output

X151 a 20
n x 100MHz
gerastet
locked

n x 100 MHz
X157

700 - 800 MHz

900 - 1200 MHz

ROHDE & SCHWARZ MÜNCHEN

Zeichn.-Nr 342.5410 S

	Name	Datum	Name
1 GMF		05.82	NL
B	28 717	07.82	NL
C	29 285	11.82	NL
D	29 285	12.82	NL
E	30 401	07.83	NL

Ausgang 1.Osz.
Output 1.Lo

Rückmischausgang 1.Osz
Reconversion 1.Lo.

X155

X156

V26 2N2907

V24 BFR 96

V25 2N2222

V138 2N2222

V64 2N2907

V65 NEC02135

V66 2N2907

V67 BFR 90

V68 2N2907

V69 BFR 96

V61 BFR 90

V60 2N2907

V31 BFR 96

V33 2N2907

V139 2N2222

V32 2N2222

N2 TFM 2

V58 2N2907

V57 2N2907

N8 4515

N9 4560

V50 2N2222

V52 2N2907

V99 2N2907

V98 2N2907

V97 2N2907

V96 2N2907

V95 2N2907

V94 2N2907

V200 - V220
21x1N4531

4x4531

2xBB405

BA379

a8, b8
1 -1,1 GHz

a9, b9
1,1 -1,2 GHz

a10, b10
1,2 - 1,3 GHz

1,30 GHz

b 30 D | b 29 C | b 28 B | b27 A
100MHz Stelle
100MHz Decade

a19 <520 MHz

a5 +30 V

b4 -10 V

a 4 +10 V

a3 +12 V

a2, b2 +5 V

Name | Datum | Änd.Mitt.Nr

Zeichn.-Nr 3425410 S

1 GMF | Datum 8.4.81 | Name Gr | B 28 717 07 82 | 05 82 NL | NL

110,7 MHz
210,7 MHz

X154

W1

V70 2N2907

V71

X50 X30 X10

V63 BFR 90

V62 2N2907

T2

X11

N5 HPF 505

X54 X34 X15

X31 X51

V79 BFT 66

V80 2N2222

V84 BF 247A

V232 BF 245

V85 2N2222

V82

N4 LF 355

V83 2N2222

N7 TDA 1004

V86 V87 V88

V89 V90 V91

V120

X12 X32 X52

V102 BFR 96

V116 2N2222

V103 2N2222

V230 2N2907

V106 BFR 96

V117 2N2222

V231 2N2907

V107 2N2222

V93 2N2907

V92 2N2907

L113 L114 L115 L117

L116 L108 L118 L143

L41 L50 L51 L52 L53 L126

L37 L44 L60 L61 L62 L63 L64 L65 L66 L67

L127 L144 L145

R222

C116 C117

C231 C230

C115

C180

C231 C230

b20
1.Osz. gerastet
1 LO locked

N6, N7

N8

N3,N4

N9

Draufsicht
Top view

V3, V14, V15, V25, V26, V32, V33, V34, V50 – V58, V60, V62, V64, V66, V68, V70, V83, V85, V92 – V99, V103, V107 V230, V231

/1, V11, V18, V79, V80, V84

VAR 02 = Grundvariante
Basic model

0 1 2 3
ZENTIMETER

Stromlauf zu Synthesizer 1 ESV

Zeichn Nr. 342.5410 S

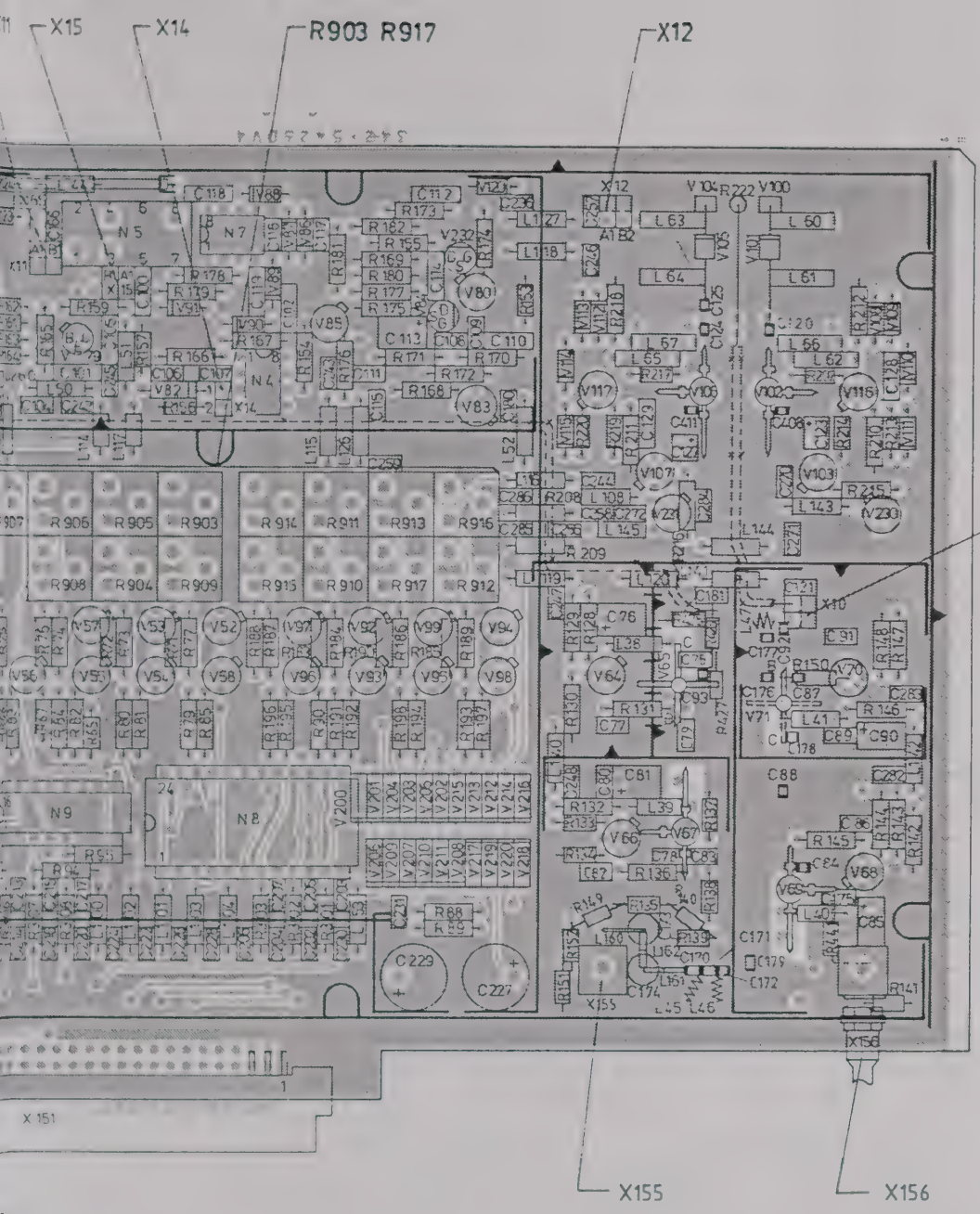
342.4020 V

342.4020

Zeichn-Nr 342.5410 S

1. GMF | Datum 8.4.81 | Name Gr | B 28.7.17 | Datum 05.82 | Name Ni | 07.82 NL

Änd Mitfg Nr | Datum | Name



E 30401 783 NL	Maße ohne Toleranzangabe	Maßstab 1 : 1
		Halbzeug Werkstoff
	1GME Name	Benennung
	Bearb 7.83 NL	Synthesizer 1 **A** Z
	Gepr	
	Norm	
	ROHDE & SCHWARZ	342.5410 2
	ESV	342.4020V ersetzt 342.4020

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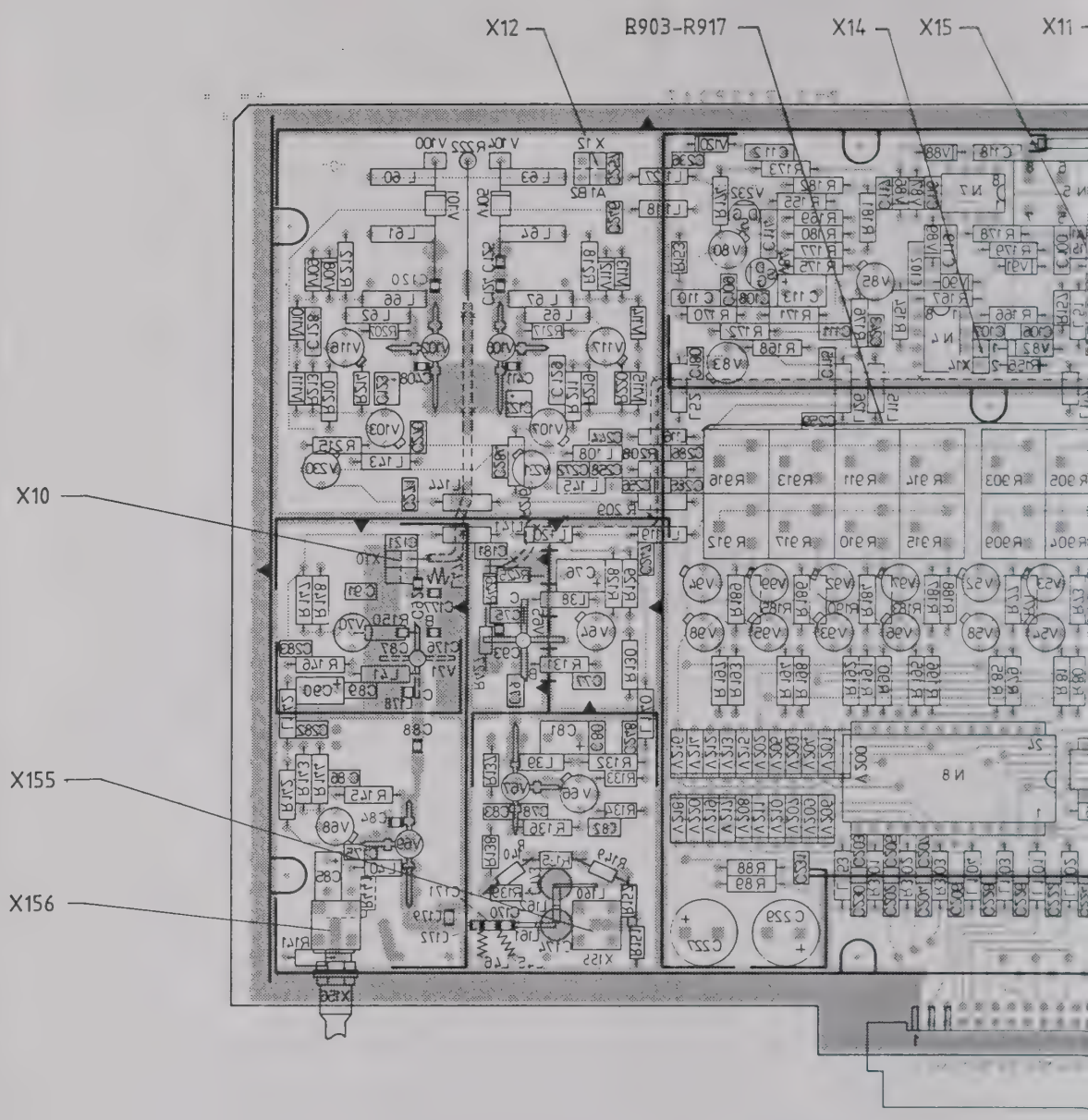
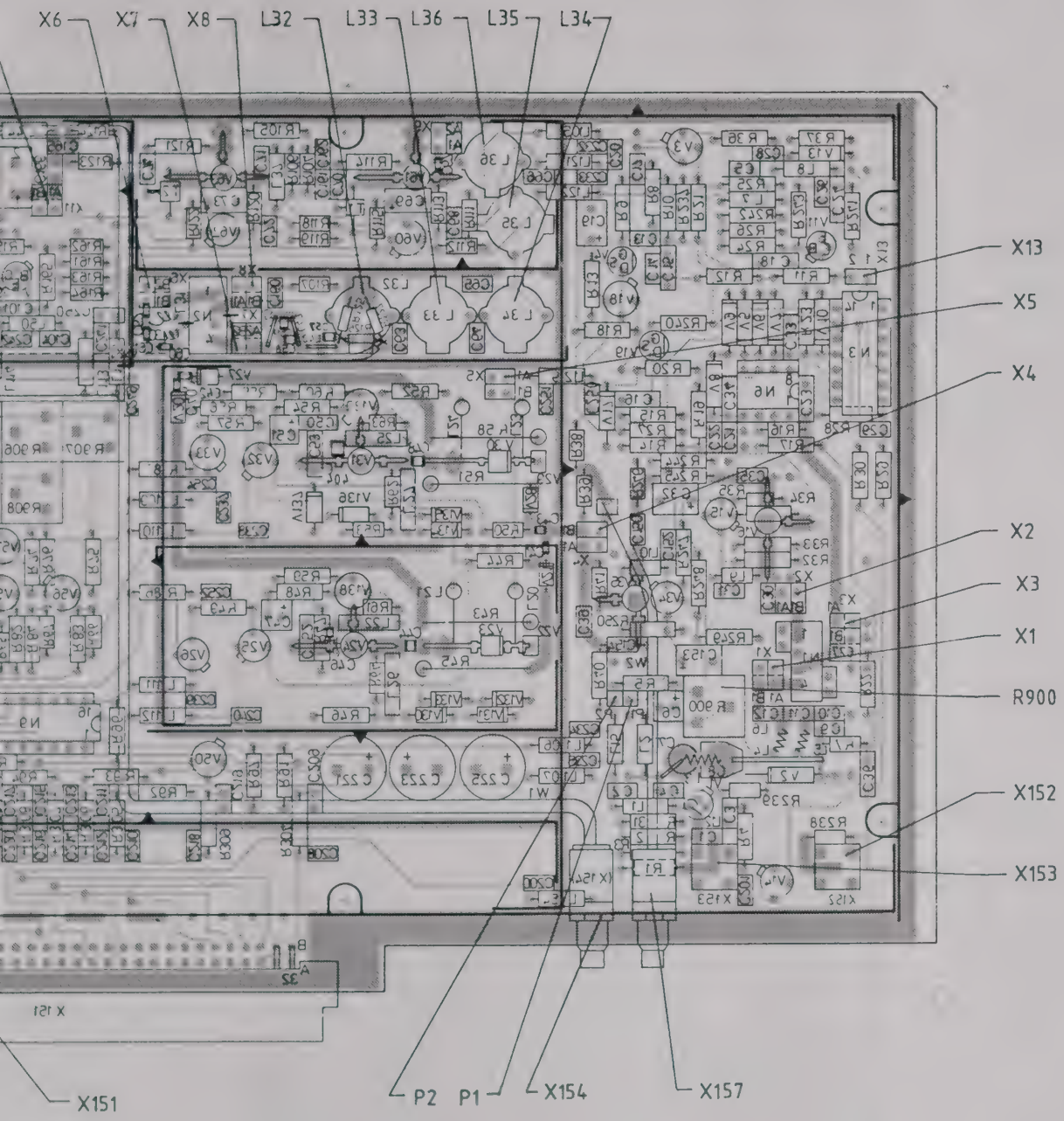


Ansicht und Leitungsführung Lötseite
View of tracks on solder side



E 30401 7.83 NL	Maße ohne Toleranzangabe		Maßstab 1 : 1	
			Halbzeug, Werkstoff	
	IGMF	Tag / Name	Benennung	
	Bearb	7.83 NL	Synthesizer 1	A
	Prüf			
	Norm			
Änd. / Datum / Name: Änderungs Mitteilung	ROHDE & SCHWARZ		342.5410	3
	ESV		342.4020V	342 4020

ROHDE&SCHWARZ

SERVICING INSTRUCTIONS

Filter Control and Pulse Generator

342.5855.03

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Circuit Components List
Circuit Diagram
Circuit Layout Plan

5 Servicing Instructions for Filter Control and Pulse Generator Board

(See Circuit Diagram 342.5855 S)

5.1 Circuit Description

The filter control receives the set frequency information with a resolution of 3 (or 4) decades. The exact relationship with reference to the filter range is shown in Table 1.

The various filter limit frequencies are programmed in the form of diode matrices. The filter control selects the correct filter range corresponding to the receive frequency and at the same time supplies the frequency-dependent tuning voltage for the input filters.

Two diode matrices on the filter control board store the ten lower and the ten upper cut-off frequencies. The correct filter range is determined by digital comparison of the tuning frequency f_M with the lower cut-off frequency f_l and the upper cut-off frequency f_u of the current frequency range based on the following simple mathematical expressions:

a) $f_M \geq f_u$: Selected range too low.

b) $f_M < f_l$: Selected range too high.

c) $f_l \leq f_M < f_u$: Selected range correct.

The comparison is implemented with the digital comparators D1, D2 and D35 for the lower filter range end and with D10, D11 and D36 for the upper filter range end.

The limit frequencies of the filter range currently programmed with the aid of the diode matrix are applied to the comparator inputs A0 to A3. The receive frequency set on the ESVP is applied to the inputs B0 to B3.

The result of the comparison is output on pins 5, 6 and 7 of D35 and D36. These output signals are combined in logic gates D7/I, D8/I, D7/II and D8/II, to inform the range counter D12 in which direction (up or down) the correct filter range is found in the shortest possible time.

The following BCD/decimal decoder controls the diode matrix and thus the particular filter range.

When the lower range end is reached, a signal is delivered to X161.a14.

The lower range frequency is subtracted from the set receive frequency in chips D3 to D6. The difference frequency is applied together with the 100-kHz and the 1-MHz decade to the data selectors D16 to D18, which permits optimum resolution for the particular filter range via the level shifters D19 to D21 at the D/A converter.

R900 permits the gain and R901 the offset of the D/A converter to be adjusted according to Table 1 (test outputs X161.a16 and a17).

N23/III together with D24 to D26 and the voltages dividers forms a programmable non-inverting amplifier. The voltage present at the connector X161.a17 is listed in Table 1 according to the filter range and the frequency setting.

Example:

The receive frequency set on the ESVP is assumed to be 145.425 MHz.

According to Table 1 this frequency is in filter range 3 and the 100-kHz decade is taken into account.

The steady-state reached will be described first.

The BCD range counter D12 supplies the numerical information 3 to D13. The BCD/decimal decoder D13 causes X161.a11 to go high and selects the filter range 3.

The diode V13 of the diode matrix applies to D1/A3 via the X161.a11 line the information f_l = 80 MHz for the selected filter range 3 and the diodes V32, V33, V41 to D10/A1, A2 and D11/A0 the information f_u = 160 MHz.

The frequency setting information (140 MHz) is applied to the B inputs of digital comparators D1, D2, D35, D10, D11 and D36.

For the set frequency: $f_l = 80\ \text{MHz} \leq 140\ \text{MHz} < 160\ \text{MHz} = f_u$.

With A < B, D35.7 goes high and with A > B, D36.5 goes high. Thus both inputs of AND gate D8/I are high and thus also its output, which disables the Carry In at D12.5.

D3 and D5 subtract the lower filter range frequency from the receive frequency setting for the 10-MHz decade (S = B - A). Hence, 145 MHz - 80 MHz = 65 MHz.

This difference frequency is now applied together with the 100-kHz decade to the data selectors D16 to D18:

The D/A conversion by D22, N23/I/II yields the following voltage at the D/A converter test output X161.a16 with the conversion factor C = 0.00833:

$$V_{DAC} = 654 \times 0.00833 = 5.45\ V$$

65 MHz — 100-kHz decade

The gain of programmable amplifier N23/III in filter range 3 is 1.125. The following voltage is thus obtained at the test output X161.a17:

$$V_{test} = V_{DAC} \times G = 5.45\ V \times 1.125 = 6.131\ V$$

With this voltage the corresponding diode tuning voltage can be determined from the characteristic curve shown in Fig. 2.

If the receive frequency information at the input of the filter control board is varied, the voltage varies by 9.39 mV/100 kHz at the test output X161.a17 in range 3.

If the receive frequency is so varied that it falls below filter range 3, the condition A = B is no longer fulfilled in D35 and input 1 of AND gate D8/I is taken low (= 0 V) via OR gate D7/I. At the same time, gating of D7/II and D8/II causes input 10 of D12 to go low (0 V).

As a result, D12 counts down with the next clock cycle and selects filter range 2. If the receive frequency is in filter range 2, the condition for the correct filter range is fulfilled and D8/I supplies a high signal to the Carry In of D12, disabling the counter.

If the receive frequency is above the filter range 3, the process is similar but the gating of D7/II and D8/III causes the counter D12 to count up.

5.1.1 Tuning Voltage Precorrection Network

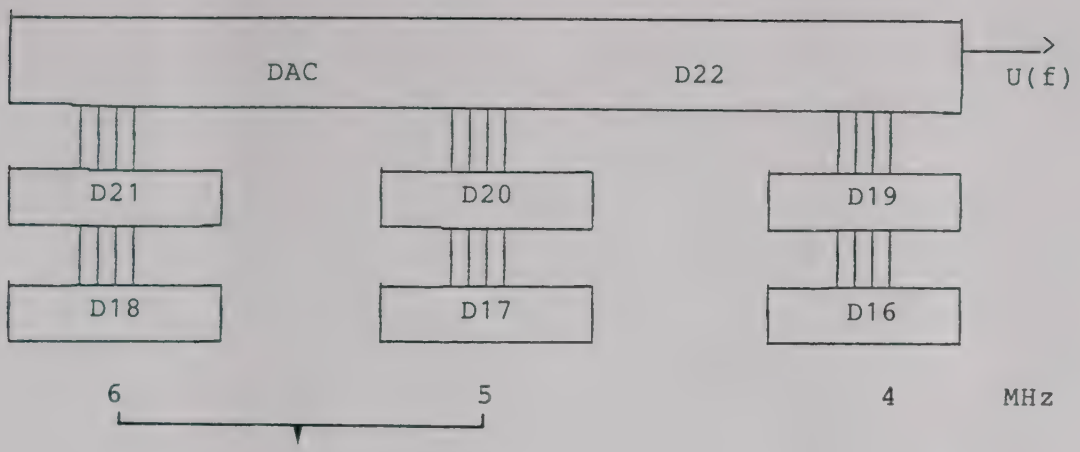
Since, because of the nonlinearity of the diode characteristic, the voltage-frequency characteristic of the varicap-tuned input filters of the ESVP is not linear, appropriate precorrection of the tuning voltage must be provided to linearize the tuning voltage.

This is accomplished by piecewise approximating the particular characteristic curve by five linear sections (Fig. 2) using the operational amplifier N31, N32 and N33. The voltage from the D/A converter is applied via appropriate dividers to the inverting inputs of the operational amplifiers. The five amplifier pairs (N31/I + N31/II, N31/III + N31/IV, N32/I + N32/II, N32/III + N32/IV, N33/I + N33/II) act as controlled voltage sources whose voltages are applied to a summation point (N30/III, pin 11) via resistors R94, R108, R122, R148 and R162. The initial value of the tuning voltage is determined at zero D/A voltage by R136 and R138. The function of the individual circuit elements is shown in Table 2 (section 5.2.3).

Table 1:

Filter-range	f_{lower} (MHz)	f_{upper} (MHz)	Δf (MHz)	100-kHz decade	Decade number
1	20	39.X	19.9XX	with	199
2	40	79.X	39.9XX	with	399
3	80	159.X	79.9XX	with	799
4	160	319.X	159.XXX	without	159
5	320	519.X	199.XXX	without	199
6	520	689.X	169.XXX	without	169
7	690	819.X	129.XXX	without	129
8	820	929.X	109.XXX	without	109
9	930	1019.X	89.XXX	without	89
10	1020	1299.X	279.XXX	without	279

X $\triangleq$ place not taken into account



145 MHz - 80 MHz = 65 MHz

$f_{receive}$ = 145,425

test .a16 ±3%)	Gain N23/III ±3%	Test output X161.a17 (V, ±3%)	Increment X161.a17 (mV)	Tuning voltage X161.a8 (V)	Control output X161 high(5V)
1.66	4.5	0 to 7.5	37.7	2 to 23.5	a9
3.33	2.25	0 to 7.5	18.8	2 to 23.5	a10
6.66	1.125	0 to 7.5	9.387	2 to 23.5	a11
1.33	5.625	0 to 7.5	47.17	2 to 23.5	a12
1.66	2.81	0 to 4.68	23.5	2 to 12.4	a13
1.41	4.24	0 to 5.97	35.3	2 to 15.9	a21
1.07	5.76	0 to 6.19	48.0	2 to 16.6	a22
0.908	6.24	0 to 5.67	52.0	2 to 14.7	a23
0.742	6.63	0 to 4.92	55.2	2 to 12.9	a24
2.32	2.96	0 to 6.88	24.7	2 to 20.15	a25

5.1.2 Pulse Generator

For calibration of the receiver, the pulse generator produces needle pulses at a repetition frequency of 100 Hz and with a flat spectrum (±0.5 dB) up to 1300 MHz. The 10-kHz TTL signal input on X161.a32 is divided by a factor of 100 in divider stages D200 and D201 to produce a 100-Hz squarewave signal which is also applied to output X161.b32 (100 Hz). The positive edges of this signal trigger the monostable D203 which, via V202 and V203, switches on the +30-V supply voltage for the step-recovery diode for about 47 µs. The step-recovery diode V200 is driven by a pulse via V204 and V205 with a delay as against the supply voltage (D202).

The timing of the pulses is shown in the following diagram:

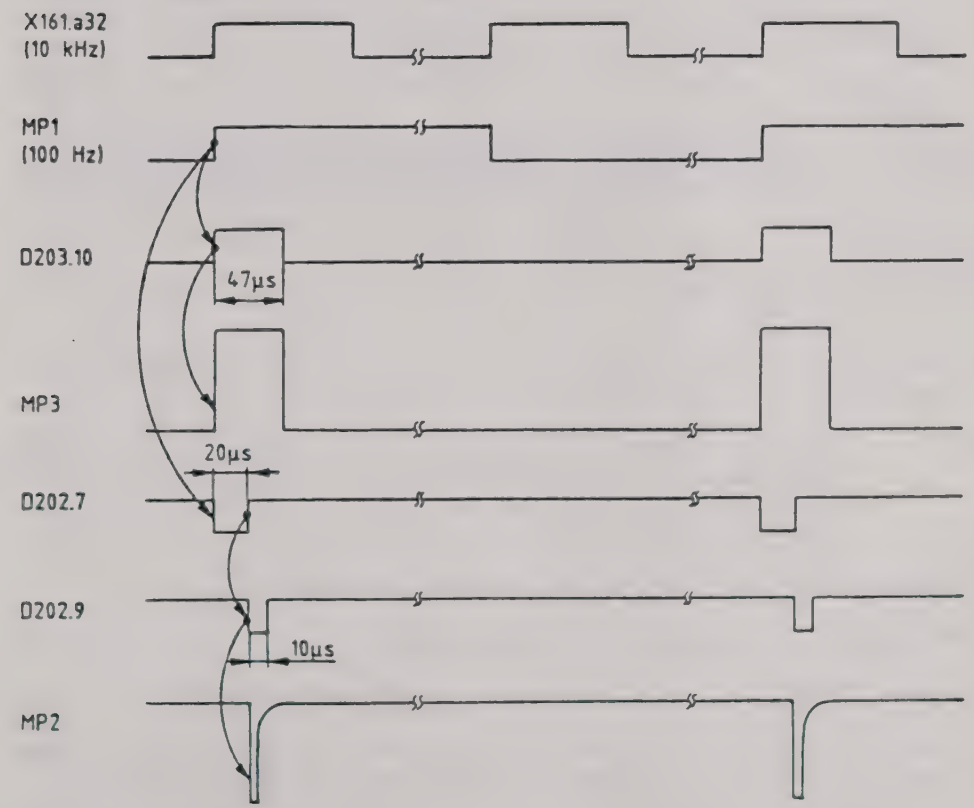


Fig. 1 Timing diagram of pulse-generator control signals

V200 ensures steep edges of the control pulses differentiated by C305 so that a very wide pulse spectrum with 100-Hz spectral line spacing is obtained. The spectrum is kept flat over the frequency range 20 to 1300 MHz by means of the trimmers C900, C901 and the frequency-dependent π-attenuator C308, R217 to R219.

5.2 Checking and Adjustments

5.2.1 Currents and Voltages

Voltage	Tolerance	Current	Tolerance	Pin
5.3 V	± 50 mV	11 mA	± 50 %	ab2
12 V	-	-	-	-
10 V	± 10 mV	7 mA	± 30 %	a4
-10 V	± 20 mV	11 mA	± 30 %	b4
+30 V	± 100 mV	0.5 mA	± 50 %	a5 *)

*) depending on filter range and set frequency

5.2.2 Filter Control Section and Generation of Linear Frequency-proportional Tuning Voltage

→ Connect a digital voltmeter to X161.a17 (range 10 V).

→ Set receive frequency (BCD inputs; see circuit diagram) to f = 160 MHz.

→ Check that X161.a10 is at high level = 5 V by means of a logic probe.

NOTE: If the signal is not statically high, either a receive frequency is applied to the filter control for which no filter range can be found or there is a fault on the circuit board.

→ Adjust R901 for 0 V on the digital voltmeter.

→ Set receive frequency to 159.9 MHz.

→ Adjust R900 for 7.5 V on the digital voltmeter.

→ With the digital voltmeter check the voltages at the upper limits of all filter ranges against the values in Table 3.

→ At a receive frequency of < 20.0 MHz, X161.a14 goes high and signals the control unit in the receiver that the receive frequency has fallen below 20 MHz. At the same time the filter range counter is switched to range 1.

5.2.3 Adjustment of Precorrection Network

a) Checking the DC voltages on dividers:

P (R100 to R102)	-1.87 ±0.05 V
Q (R114 to R116)	-4.69 ±0.05 V
R (R140 to R142)	-5.62 ±0.05 V
S (R154 to R156)	-6.56 ±0.05 V

b) Adjustment of the tuning voltage V_D:

- Connect voltmeter to test point MP1/8.

- Set frequency to 90.00 MHz.
  Adjust potentiometer B (R96) for 3.60 ±0.005 V.

- Set frequency to 130.00 MHz.
  Adjust potentiometer C (R110) for 12.40 ±0.005 V.

- Set frequency to 159.90 MHz.
  Nominal voltage: V_D = 23.50 ±0.1 V. Correct with R96, if necessary, and check voltage at a frequency of 130.00 MHz: V_D = 12.40 ±0.05 V.

- Make final check according to Fig. 2.

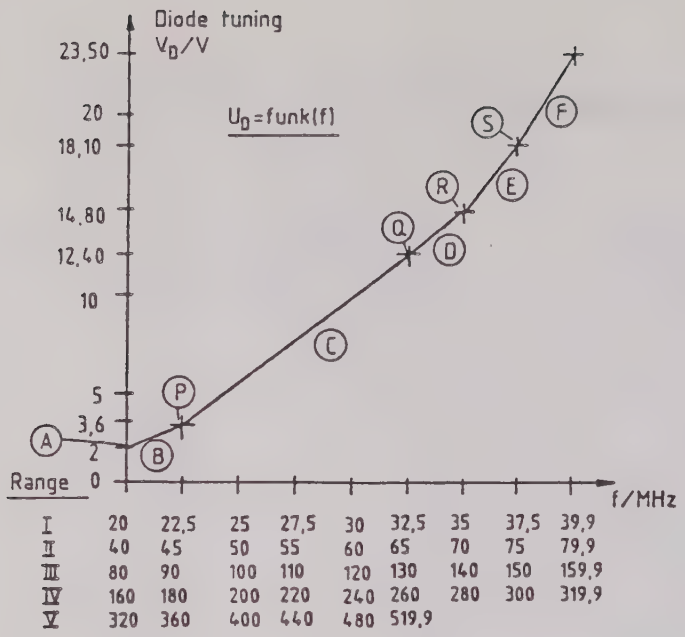


Fig. 2 Diode tuning voltage / frequency characteristic

The function of the various circuit elements can be seen from the following table:

Table 2

		Determined by	From break-point	the slope of the characteristic is determined by
Initial value of the tuning voltage	A	R136, R138	A	R 96(B), N31/II
Break-point	P	R100, R101, N31/III	P	R 110(C), N31/IV
"	Q	R114, R116, N32/I	Q	R124, R126(D), N32/II
"	R	R140, R142, N32/III	R	R150, R152(E), N32/IV
"	S	R154, R156, N33/I	S	R164, R166(F), N33/II

The operational amplifier N30/III together with V92 functions as inverse adder with G = 6 for the tuning voltage.

Table 3
(See Fig. 2)

f/MHz	Voltage on MP1(n), in Volts (2)	(3)	(4)	(5)	(6)	(7)	Diode tuning voltage (8) or X161.a8	
80	(0 ± 0.5mV)	(0 ± 3mV)	(0 ±3mV)	(0 ±3 mV)	(0 ±5 mV)	(0 ±6 mV)	2.00 ±0.05	A
85	0.4687	-0.133	"	"	"	"	2.80 ±0.03	
90	0.9375	-0.26	" (P)	"	"	"	3.60 ±0.002	P
95	1.4062	-0.4	-0.05	"	"	"	4.70 ±0.05	
100	1.8750	-0.53	-0.1	"	"	"	5.80 ±0.05	
105	2.3437	-0.6	-0.15	"	"	"	6.90 ±0.05	
110	2.8125	-0.8	-0.2	"	"	"	8.00 ±0.05	
115	3.2812	-0.93	-0.25	"	"	"	9.10 ±0.05	
120	3.7500	-1.06	-0.3	"	"	"	10.20 ±0.05	
125	4.2187	-1.2	-0.35	"	"	"	11.30 ±0.05	
130	4.6875	-1.3	-0.4	" (Q)	"	"	12.40 ±0.05	Q
135	5.1562	-1.46	-0.45	-0.016	"	"	13.60 ±0.06	
140	5.6250	-1.6	-0.5	-0.03	" (R)	"	14.80 ±0.06	R
145	6.0937	-1.75	-0.55	-0.05	-0.075	"	16.45 ±0.07	
150	6.5625	-1.86	-0.6	-0.06	-0.150	" (S)	18.10 ±0.07	S
155	7.0312	-2	-0.65	-0.083	-0.225	-0.175	20.80 ±0.08	
159.99	7.500	-2.13	-0.7	-0.1	-0.3	-0.350	23.50 ±0.1	
Tole-rance	< ±1%	< ±5%	< ±5%	< ±10%	< ±10%	< ±10%	Absolute tolerances	

Voltage at the voltage dividers for f = 155.9 MHz. Voltage tolerance ±0.08 V

V_A (R136-R138) : -2.03 V
V_Q (R114-R116) : -4.6875 V
V_S (R154-R156) : -6.5625 V
V_B (R96-R99) : -4.80 V
V_D (R124-R126) : -1.44 V
V_P (R164-R166) : -0.64 V
V_P (R100-R102) : -0.9375 V
V_R (R140-R142) : -5.6250 V
V_C (R110-R113) : -3.63 V
V_E (R150-R152) : -1.08 V

5.2.4 Pulse Generator

5.2.4.1 Checking the Control Signals

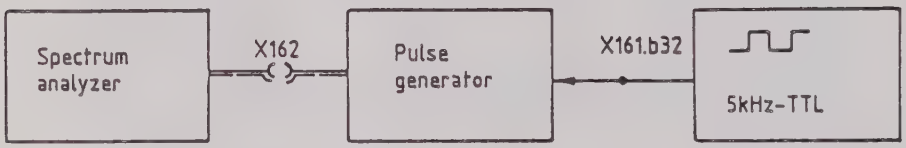
Apply a logic high signal (5 V) to

+ X161.b9 (CAL)
+ Apply a 10-kHz TTL signal to X161.a32 (10-kHz ref.).

Check the pulses at the test points MP1 to MP3 against the timing diagram in section 5.1.2.

5.2.4.2 Checking the Pulse Frequency Spectrum

Test setup:



+ Remove D201

+ Apply a high signal (+5 V) to X161.b9.

+ Settings on analyzer:

VIDEO BW	: 1 MHz
RES BW	: 1 MHz
START	: 20 MHz
STOP	: 1300 MHz
ATTEN	: 20 dB
REF	: 67 dBµV
Resolution	: 1 dB/div.
SWEEP TIME	: 5 s

+ with C900 adjust pulse spectrum to 60 dBµV ±1 dBµV.

- If necessary the spectrum level can be reduced by reducing R217.

5.2.4.3 Adjustment of Spectrum at 100 MHz

→ Connect test receiver to connector X162.

Settings: Input frequency : 100 MHz
RF attenuation : 10 dB
IF attenuation : 40 dB
IF bandwidth : 1 MHz
Indicating mode : Peak value
Operating range : 20 dB linear

The measuring accuracy of the receiver must be checked with a thermal power meter (the input cable loss must be taken into account).

The bandwidth-correction ΔV must be determined. This value depends on the actual 6-dB IF bandwidth. It can be determined either by comparison with a standard-pulse generator (e.g. the Schwarzbeck IGU 2912) or calculated with the formula

$$\Delta V = 20 \times \log (BW_{IF}/MHz).$$

The actual pulse voltage is

$$V(dB\mu V/MHz) = V_{ind} + \Delta V.$$

→ With C900, adjust level of pulse-generator output to 60 dBµV ±0.2 dBµV.

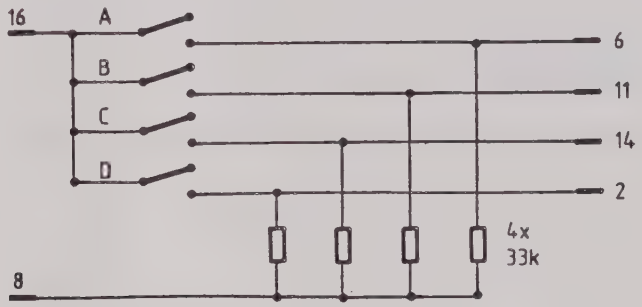
5.3.1 Filter Control Section and Generation of Tuning Voltage

→ If the correct filter range is not found, check at D12.6 whether the range counter comes to a stop.

NOTE: If a fault develops that prevents finding the correct filter range, it is likely that the counter D12 constantly scans the filter range with the 100-Hz clock frequency. This considerably complicates troubleshooting and may be overcome as follows:

→ Remove D12 from its socket and insert the following circuit via a dual-in-line plug in its place:

BCD thumb-wheel switch



It is then possible to select any filter range and check the search criteria for all filter ranges.

→ Determine the selected filter range at the outputs of D13.

→ Check the signals at the A and B inputs of the digital comparators.

→ Determine the result of the comparison at the comparator pins 5 to 7.

→ The BCD information of the set receive frequency minus the lower limit frequency of the selected filter range must appear at the inputs of D22.

→ The frequency resolution 100 kHz or 1 MHz depends on the control of the data selectors D16 to D18.

→ The functioning of N23 can be checked at the test outputs X161.a16 and 17 with use of Table 1.

Tuning voltage precorrection network

Check:

- the diode tuning voltage as a function of the frequency at MP1/8 or X161.a8 against Fig. 2.
- the voltages at the voltage dividers against the values in Table 3.
- the offset voltages at f = 79.9 MHz at MP1/2 to 7 against Table 3.
- the voltage characteristic as a function of frequency at MP1/2 to 7 against Table 3.
- N30, V92.

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C4	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C5	CC 10NF-20+50%7X8R6000 CAPACITOR THOMSON COX767/10000/PF-20+5	CC 087.7525	
C6	CC 100PF+-2%4X5N750 CAPACITOR DRALORIC EDPU4X5/100/2%N750	CC 087.6906	
C7	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	CE 022.7550	
C8	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR DRALORIC EDPU4X5/63V1000/10%	CC 022.0784	
C9	CE 22UF -10+100%40V 9X13 ELECTROLYTIC CAPACITOR SIEMENS B4136-B7226-Z	CE 022.7572	
C20	CE 220UF-10+100% 6V 11X13 ELEKTROLYTIC CAPACITOR ROE EK 00 EB322 B	CE 022.7520	
BIS/TO C24			
C200	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR DRALORIC EDPU4X5/63V1000/10%	CC 022.0784	
C201	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR DRALORIC EDPU4X5/63V1000/10%	CC 022.0784	
C202	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR DRALORIC EDPU4X5/63V1000/10%	CC 022.0784	
C303	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR DRALORIC EDPU4X5/63V1000/10%	CC 022.0784	
C304	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR DRALORIC EDPU4X5/63V1000/10%	CC 022.0784	
C305	CC 1,5NF+-10%100V3K1200 C CAPACITOR VITRAMON VJ1005Y152KFB	CC 082.3244	
C306	CC 4,7NF+-10%100V3K1200 C CAPACITOR VITRAMON VJ1005Y472KFB	CC 082.3309	
C308	TRIMMWERT COMP. SEL. UNDER TEST CC 082.3009		
C309	CE 47UF -10+100%40V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-B7476-Z	CE 022.7589	
C310	CE 47UF -10+100%40V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-B7476-Z	CE 022.7589	
C900	CT TRIMMKONDENS.1,5...5PF TRIMMER KYOCERA TCR 3F 1,5-5 PF	527.2650	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C901	CT TRIMMKONDENS.1,5...5PF TRIMMER KYOCERA TCR 3P 1,5-5 PF	527.2650	
D1	BL CD4063BF 4BIT-COMPARAT IC 4BIT-COMPARATOR RCA CD4063BF	BL 526.1109	
D2	BL CD4063BF 4BIT-COMPARAT IC 4BIT-COMPARATOR RCA CD4063BF	BL 526.1109	
D3	BL MC14560BAL NBD-ADDER MC14560BAL NBCD-ADDER MOTOROLA MC14560BAL	BL 303.9547	
D4	BL MC14560BAL NBD-ADDER MC14560BAL NBCD-ADDER MOTOROLA MC14560BAL	BL 303.9547	
D5	BL MC14561BAL 9'S-COMPLEM 14561BAL 9'-COMPLEMENT MOTOROLA MC14561BAL	BL 303.9553	
D6	BL MC14561BAL 9'S-COMPLEM 14561BAL 9'-COMPLEMENT MOTOROLA MC14561BAL	BL 303.9553	
D7	BL MC14071BAL 4/2INP.ORG. IC OR GATE MC14071BAL MOTOROLA MC14071BAL	BL 418.0158	
D8	BL CD4081BF 4/2INP.ANDG. IC AND-GATE CD4081 BF RCA CD4081BF	BL 531.0259	
D9	BL CD4011BF 4/2INP.NANDG. IC NAND GATE RCA CD4011BF	BL 517.7572	
D10	BL CD4063BF 4BIT-COMPARAT. IC 4BIT-COMPARATOR RCA CD4063BF	BL 526.1109	
D11	BL CD4063BF 4BIT-COMPARAT IC 4BIT-COMPARATOR RCA CD4063BF	BL 526.1109	
D12	BL CD4029BF UP/DOWN-COUNT IC COUNTER SSS SCL4029BC	BL 290.1149	
D13	BL SCL4028BC BCD/DEZ.DEC. IC DECODER MOTOROLA MC14028BAL	BL 290.1178	
D14	BL CD4011BF 4/2INP.NANDG. IC NAND GATE RCA CD4011BF	BL 517.7572	
D15	BL MC14075BAL 3/3INP.ORG. IC OR GATE MC14075BAL RCA CD4075BF	BL 418.0164	
D16	BL CD4019BF 4/2INP.SELECT BL CD4019BF 4/2INP.SELECT SSS SCL4019BC	BL 547.9896	
D17	BL CD4019BF 4/2INP.SELECT BL CD4019BF 4/2INP.SELECT SSS SCL4019BC	BL 547.9896	
D18	BL CD4019BF 4/2INP.SELECT BL CD4019BF 4/2INP.SELECT	BL 547.9896	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	SSS SCL4019BC		
D19	BL 4104BDM 4XPEGEL-UMSETZ 4104BDM 4XLEVEL-CONVERTER FAIRCHILD 4104BDM	BL 303.9530	
D20	BL 4104BDM 4XPEGEL-UMSETZ 4104BDM 4XLEVEL-CONVERTER FAIRCHILD 4104BDM	BL 303.9530	
D21	BL 4104BDM 4XPEGEL-UMSETZ 4104BDM 4XLEVEL-CONVERTER FAIRCHILD 4104BDM	BL 303.9530	
D22	BJ AD7525BD 3,5-D/A -CONV D/A-CONVERTER ANALOG DEV AD7525BD	BJ 343.0105	
D24	BL CD4016BF 4/ANALOGSWITC IC ANALOG SWITCH CD4016BF RCA CD4016BF	BL 086.8040	
D25	BL CD4016BF 4/ANALOGSWITC IC ANALOG SWITCH CD4016BF RCA CD4016BF	BL 086.8040	
D26	BL CD4016BF 4/ANALOGSWITC IC ANALOG SWITCH CD4016BF RCA CD4016BF	BL 086.8040	
D35	BL CD4063BF 4BIT-COMPARAT IC 4BIT-COMPARATOR RCA CD4063BF	BL 526.1109	
D36	BL CD4063BF 4BIT-COMPARAT IC 4BIT-COMPARATOR RCA CD4063BF	BL 526.1109	
D38	BL HEF4104BP 4XPEGELUMS. BL HEF4104BP 4XPEGELUMS. VALVO HEF4104BP	BL 252.7395	
D39	BL HEF4104BP 4XPEGELUMS. BL HEF4104BP 4XPEGELUMS. VALVO HEF4104BP	BL 252.7395	
D40	BL HEF4104BP 4XPEGELUMS. BL HEF4104BP 4XPEGELUMS. VALVO HEF4104BP	BL 252.7395	
D200	BL MC14510BAL BCD-COUNTER IC COUNTER MC14510BAL RCA CD4510BF	BL 418.0229	
D201	BL MC14510BAL BCD-COUNTER IC COUNTER MC14510BAL RCA CD4510BF	BL 418.0229	
D202	BL MC14538BAL 2XMONOFLOP BL MC14538BAL 2XMONOFLOP MOTOROLA MC14538BAL	BL 526.5427	
D203	BL MC14538BAL 2XMONOFLOP BL MC14538BAL 2XMONOFLOP MOTOROLA MC14538BAL	BL 526.5427	
L200	LD 100 UH10%8,000HMQ,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
MP1	FP WINKELSTECKERLEIST.36P CONNECTOR BERG 75168-113-36	FP 243.3578	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	1X8-POLIG		
MP2	VL WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
MP3	VL WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
N23	BO TL044MJ 4XOP-AMPL. IC OPERATION AMPLIFIER TL TEXAS TL044MJ	BO 302.5248	
N30	BO TL044MJ 4XOP-AMPL. IC OPERATION AMPLIFIER TL TEXAS TL044MJ	BO 302.5248	
N31	BO TL044MJ 4XOP-AMPL. IC OPERATION AMPLIFIER TL TEXAS TL044MJ	BO 302.5248	
N32	BO TL044MJ 4XOP-AMPL. IC OPERATION AMPLIFIER TL TEXAS TL044MJ	BO 302.5248	
N33	BO TL044MJ 4XOP-AMPL. IC OPERATION AMPLIFIER TL TEXAS TL044MJ	BO 302.5248	
R1	RF 0,25W100KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%100K	RF 069.1041	
BIS/TO R9			
R10	RF 0,25W 33KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%33K	RF 069.3338	
R20	RF 0,25W100KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%100K	RF 069.1041	
BIS/TO R28			
R32	RF 0,25W 33KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%33K	RF 069.3338	
R33	RF 0,25W100KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%100K	RF 069.1041	
R34	RL 0,25W 68,1KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/68,1K-F-0	RL 082.2602	
R35	RL 0,25W 68,1KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/68,1K-F-0	RL 082.2602	
R36	RL 0,25W 68,1KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/68,1K-F-0	RL 082.2602	
R37	TRIMMWERT COMP. SEL. UNDER TEST		
R40	RF 0,25W 33KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%33K	RF 069.3338	
R45	RF 0,25W100KOHM +-5% RESISTOR	RF 069.1041	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DRALORIC LCA0207/+-5%100K		
R46	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R47	RL 0,25W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R48	RL 0,25W 16,2KOHM+-1%TK50	RL 083.1439	
	RESISTOR		
	DRALORIC SMA0207/16,2K-F-D		
R49	RL 0,25W14,2KOHM+-0,1%T25	RL 084.3358	
	RESISTOR		
R50	RF 0,25W100KOHM +-5%	RF 069.1041	
	RESISTOR		
	DRALORIC LCA0207/+-5%100K		
R51	RF 0,25W1,8MOHM +-5%	RF 069.1858	
	RESISTOR		
	DRALORIC LCA0207/+-5%1,8M		
R52	RL 0,25W 8,66KOHM+-1%TK50	RL 083.1251	
	RESISTOR		
	DRALORIC SMA0207/8,66K-F-D		
R53	RL 0,25W24,9 KOHM+-1%TK50	RL 082.1758	
	RESISTOR		
	DRALORIC SMA0207/24,9K-F-C		
R54	RF 0,25W 33KOHM +-5%	RF 069.3338	
	RESISTOR		
	DRALORIC LCA0207/+-5%33K		
R55	RF 0,25W2,7KOHM +-5%	RF 069.2725	
	RESISTOR		
	DRALORIC LCA0207/+-5%2,7K		
R56	RF 0,25w2,7KOHM +-5%	RF 069.2725	
	RESISTOR		
	DRALORIC LCA0207/+-5%2,7K		
R57	RF 0,25W 33KOHM +-5%	RF 069.3338	
	RESISTOR		
	DRALORIC LCA0207/+-5%33K		
R58	TRIMMWERT		
	COMP. SEL. UNDER TEST		
R59	TRIMMWERT		
	COMP. SEL. UNDER TEST		
R60	RL 0,25W 113KOHM+-1%TK50	RL 082.2248	
	RESISTOR		
	DRALORIC SMA0207/113K-F-C		
R61	RL 0,25W 56,2KOHM+-1%TK50	RL 082.2231	
	RESISTOR		
	DRALORIC SMA0207/56,2K-F-C		
R62	RL 0,25W 28,0KOHM+-1%TK50	RL 083.1600	
	RESISTOR		
	DRALORIC SMA/207/28,0K-F-C		
R63	RL 0,25W 140 KOHM+-1%TK50	RL 083.2106	
	RESISTOR		
	DRALORIC SMA0207/140K-F-C		
R64	RL 0,25W 59,0KOHM+-1%TK50	RL 083.1845	
	RESISTOR		
	DRALORIC SMA0207/59,0K-F-C		
R65	RL 0,25W 68,1KOHM+-1%TK50	RL 082.2602	
	RESISTOR		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DRALORIC SMA 0207/68,1K-F-C		
R66	RL 0,25W 32,4KOHM+-1%TK50 RESISTOR	RL 083.1668	
	DRALORIC SMA0207/32,4K-F-C		
R67	RL 0,25W 45,3KOHM+-1%TK50 RESISTOR	RL 082.2225	
	DRALORIC SMA0207/45,3K-F-C		
R68	RL 0,25W 226 KOHM+-1%TK50 RESISTOR	RL 083.2287	
	DRALORIC SMA0207/226K-F-C		
R69	RL 0,25W 30,1KOHM+-1%TK50 RESISTOR	RL 083.1639	
	DRALORIC SMA0207/30,1K-F-C		
R70	RL 0,25W 32,4KOHM+-1%TK50 RESISTOR	RL 083.1668	
	DRALORIC SMA0207/32,4K-F-C		
R85	RL 0,25W 21,0KOHM+-1%TK50 RESISTOR	RL 083.1539	
	DRALORIC SMA/207/21,0K-F-C		
R86	RL 0,25W 14,3KOHM+-1%TK50 RESISTOR	RL 083.1380	
	DRALORIC SMA0207/14,3K-F-D		
R87	RL 0,25W 13,0KOHM+-1%TK50 RESISTOR	RL 083.1368	
	DRALORIC SMA0207/13,0K-F-D		
R88	RL 0,25W 12,1KOHM+-1%TK50 RESISTOR	RL 083.1351	
	DRALORIC SMA0207/12,1K-F-D		
R89	TRIMMWERT COMP. SEL. UNDER TEST		
R90	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR	RL 082.6114	
	DRALORIC SMA 0207/49,9K-F-C		
R91	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR	RL 082.6114	
	DRALORIC SMA 0207/49,9K-F-C		
R92	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR	RL 082.6114	
	DRALORIC SMA 0207/49,9K-F-C		
R93	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR	RL 082.6114	
	DRALORIC SMA 0207/49,9K-F-C		
R94	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR	RL 082.6114	
	DRALORIC SMA 0207/49,9K-F-C		
R95	RL 0,25W24,9 KOHM+-1%TK50 RESISTOR	RL 082.1758	
	DRALORIC SMA0207/24,9K-F-C		
R96	RS 0,75W10KOHM+-10%CERMET DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-10 KOHM+-10%	RS 037.7396	
R99	RF 0,25W 10 OHM +-5% RESISTOR	RF 069.1006	
	DRALORIC LCA0207/+-5%10		
R100	RL 0,25W 9,09KOHM+-1%TK50 RESISTOR	RL 082.2177	
	DRALORIC SMA0207/9,09K-F-C		

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R101	RF 0,25W 22KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%22K	RF 069.2231	
R102	RL 0,25W 976 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/976OHM-F-D	RL 083.0603	
R103	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R104	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R105	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R106	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R107	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R108	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R109	RL 0,25W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	
R110	RS 0,75W10KOHM+-10%CERMET DEPOS.-CARBON POTENTIOMET BOURNS 3C06P-1-10 KOHM+-10%	RS 037.7396	
R113	RF 0,25W 10 OHM +-5% RESISTOR DRALORIC LCA0207/+-5%10	RF 069.1006	
R114	RL 0,25W 5,11KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,11K-F-C	RL 082.2348	
R116	RL 0,25W 4,87KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,87K-F-D	RL 083.1100	
R117	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R118	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R119	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R120	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R121	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R122	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R123	RL 0,25W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	
R124	RL 0,25W 4,87KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,87K-F-D	RL 083.1100	
R126	RL 0,25W 5,23KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,23K-F-D	RL 083.1122	
R127	RF 0,25W 10 OHM +-5% RESISTOR DRALORIC LCA0207/+-5%10	RF 069.1006	
R130	RL 0,25W 11,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/11,5K-F-D	RL 083.1339	
R131	RF 0,25W510KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%510K	RF 069.5147	
R132	RF 0,25W 10KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%10K	RF 069.1035	
R133	RL 0,25W 300KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/300K-F-D	RL 082.7840	
R134	RL 0,25W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R135	RL 0,25W 300KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/300K-F-D	RL 082.7840	
R136	RL 0,25W 7,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/7,5K-F-D	RL 083.1197	
R138	RL 0,25W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	
R140	RL 0,25W 4,12KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,12K-F-D	RL 083.1051	
R142	RL 0,25W 5,90KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,90K-F-D	RL 083.1145	
R143	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R144	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R145	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R146	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R147	RL 0,25W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R148	RL 0,25W 49,9KOHM+-1%TK50	RL 082.6114	
	RESISTOR		
	DRALORIC SMA 0207/49,9K-F-C		
R149	RL 0,25W 18,2KOHM+-1%TK50	RL 083.1480	
	RESISTOR		
	DRALORIC SMA/207/18,2K-F-C		
R150	RL 0,25W 4,32KOHM+-1%TK50	RL 082.6572	
	RESISTOR		
	DRALORIC SMA0207/4,32K-F-D		
R152	RL 0,25W 5,90KOHM+-1%TK50	RL 083.1145	
	RESISTOR		
	DRALORIC SMA0207/5,90K-F-D		
R153	RF 0,25W 10 OHM +-5%	RF 069.1006	
	RESISTOR		
	DRALORIC LCA0207/+-5%10		
R154	RL 0,25W 3,16KOHM+-1%TK50	RL 083.0984	
	RESISTOR		
	DRALORIC SMA0207/3,16K-F-D		
R156	RL 0,25W 6,81KOHM+-1%TK50	RL 082.2560	
	RESISTOR		
	DRALORIC SMA 0207/6,81K-F-C		
R157	RL 0,25W 49,9KOHM+-1%TK50	RL 082.6114	
	RESISTOR		
	DRALORIC SMA 0207/49,9K-F-C		
BIS/TO R162			
R163	RL 0,25W 18,2KOHM+-1%TK50	RL 083.1480	
	RESISTOR		
	DRALORIC SMA/207/18,2K-F-C		
R164	RL 0,25W 3,09KOHM+-1%TK50	RL 083.0978	
	RESISTOR		
	DRALORIC SMA0207/3,09K-F-D		
R166	RL 0,25W 6,81KOHM+-1%TK50	RL 082.2560	
	RESISTOR		
	DRALORIC SMA 0207/6,81K-F-C		
R167	RF 0,25W 10 OHM +-5%	RF 069.1006	
	RESISTOR		
	DRALORIC LCA0207/+-5%10		
R170	RF 0,25W 10KOHM +-5%	RF 069.1035	
	RESISTOR		
	DRALORIC LCA0207/+-5%10K		
R203	RF 0,25W 47KOHM +-5%	RF 069.4734	
	RESISTOR		
	DRALORIC LCA0207/+-5%47K		
R204	RF 0,25W4,7KOHM +-5%	RF 069.4728	
	RESISTOR		
	DRALORIC LCA0207/+-5%4,7K		
R205	RF 0,25W4,7KOHM +-5%	RF 069.4728	
	RESISTOR		
	DRALORIC LCA0207/+-5%4,7K		
R206	RF 0,25W 10KOHM +-5%	RF 069.1035	
	RESISTOR		
	DRALORIC LCA0207/+-5%10K		
R207	RF 0,25W2,2KOHM +-5%	RF 069.2225	
	RESISTOR		
	DRALORIC LCA0207/+-5%2,2K		
R208	RF 0,25W 20KOHM +-5%	RF 069.2031	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	RESISTOR DRALORIC LCA0207/+-5%20K		
R209	RF 0,25W 10KOHM +-5%	RF 069.1035	
	RESISTOR DRALORIC LCA0207/+-5%10K		
R210	RF 0,25W4,7KOHM +-5%	RF 069.4728	
	RESISTOR DRALORIC LCA0207/+-5%4,7K		
R211	RF 0,25W4,7KOHM +-5%	RF 069.4728	
	RESISTOR DRALORIC LCA0207/+-5%4,7K		
R212	RF 0,25W 20KOHM +-5%	RF 069.2031	
	RESISTOR DRALORIC LCA0207/+-5%20K		
R213	RF 0,25W4,7KOHM +-5%	RF 069.4728	
	RESISTOR DRALORIC LCA0207/+-5%4,7K		
R214	RF 0,25W 10KOHM +-5%	RF 069.1035	
	RESISTOR DRALORIC LCA0207/+-5%10K		
R215	RL 0,13W 68 OHM2% UNGEW.	RL 092.5933	
	RESISTOR RESISTA MK1 680HM 2% UNGEW.		
	TRIMMWERT		
R216	RL 0,13W 270 OHM2% UNGEW.	RL 092.6000	
	RESISTOR RESISTA MK1 2700HM 2% UNGEW.		
R217	TRIMMWERT COMP. SEL. UNDER TEST 092.5956		
R218	TRIMMWERT COMP. SEL. UNDER TEST 092.5904		
R219	RL 0,13W 150 OHM2% UNGEW.	RL 092.5979	
	RESISTOR RESISTA MK1 1500HM 2% UNGEW.		
R900	RS 0,75W 5KOHM+-10%CERMET	RS 037.7380	
	DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-5 KOHM+-10%		
R901	RS 0,75W 100KOHM+-10%CERM	RS 037.7438	
	DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-100KOHM+-10%		
V1	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
BIS/TO V51			
V55	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
BIS/TO V60			
V69	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V70	AD 1N4531 75V 0,15A UDI	AD 082.6514	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	DIODE UNITRODE 1N4531		
V71	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	
V72	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V73	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V75	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
BIS/TO V84			
V85	AE BZX55/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/C5V1	AE 012.2449	
V92	AK 2N2905A PNP 60V 600MA TRANSISTOR VALVO 2N2905A	AK 010.3919	
V168	AD 1N4531 75V 0,15A UDI DIODE UNITRODE 1N4531	AD 082.6514	
V200	AE 5082-0833 25V STEPR.DI DIODE HEWLETT-P. 5082-0833 HP5082-0833 343.0086	AE 343.0086	
V202	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
V203	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V204	AK 2N2907A PNP 60V 600MA TRANSISTOR VALVO 2N2907A	AK 010.3583	
V205	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	
X1	VL WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X3	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X4	VL WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X14	FP KURZSCHLUSSBUCHSE SHORTING PLUG BERG 65474-004	FP 491.7042	
X161	FP STECKERL.INDIP.64POLIG 64-PIN INSERT ERNI STV-P-264 9722.333.	FP 084.6470	
X162	FJ EINBAUWINKELST. SMC ANGLE CONNECTOP	FJ 249.9684	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	RADIALL R 112 669		
			- ENDE -

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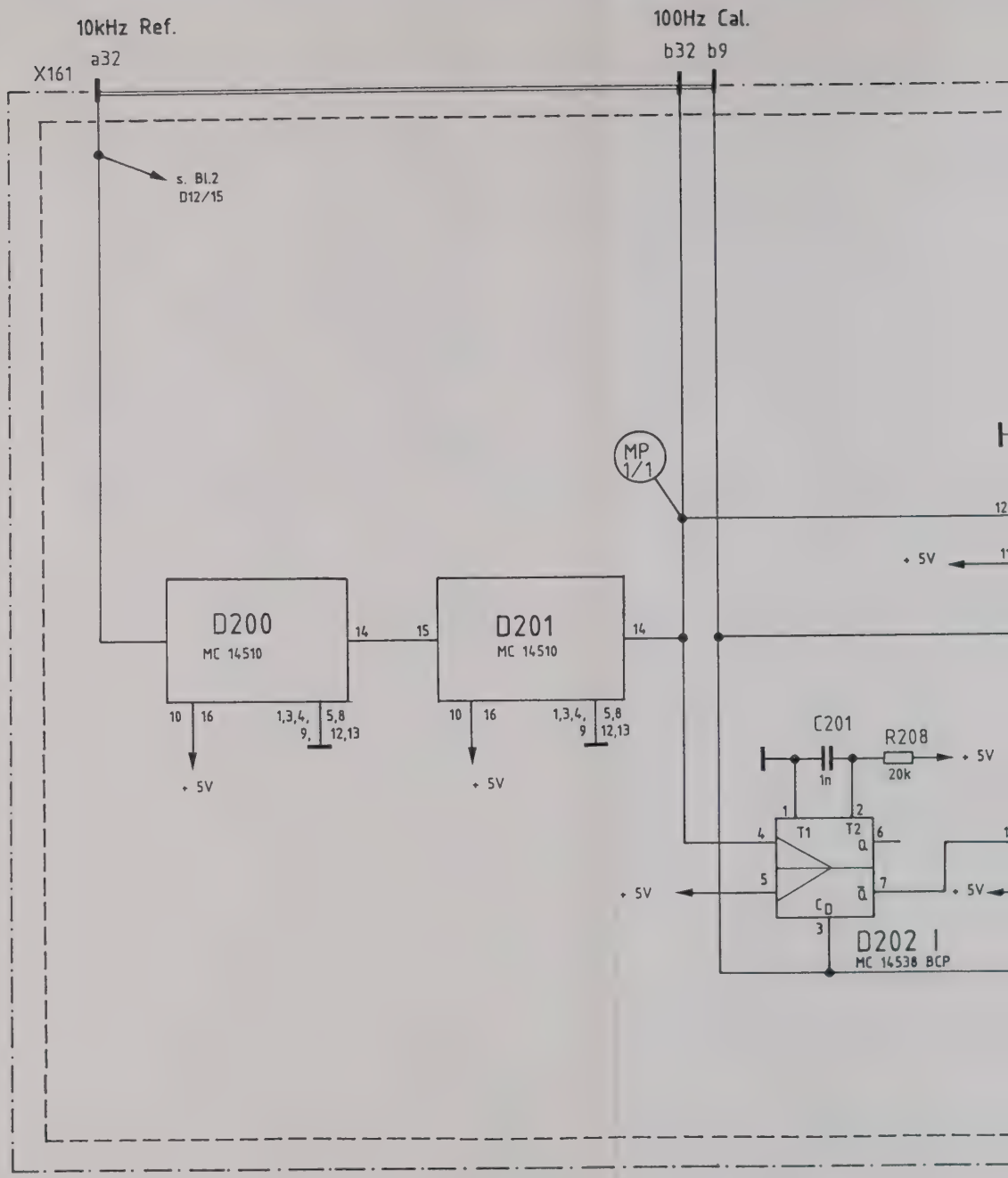
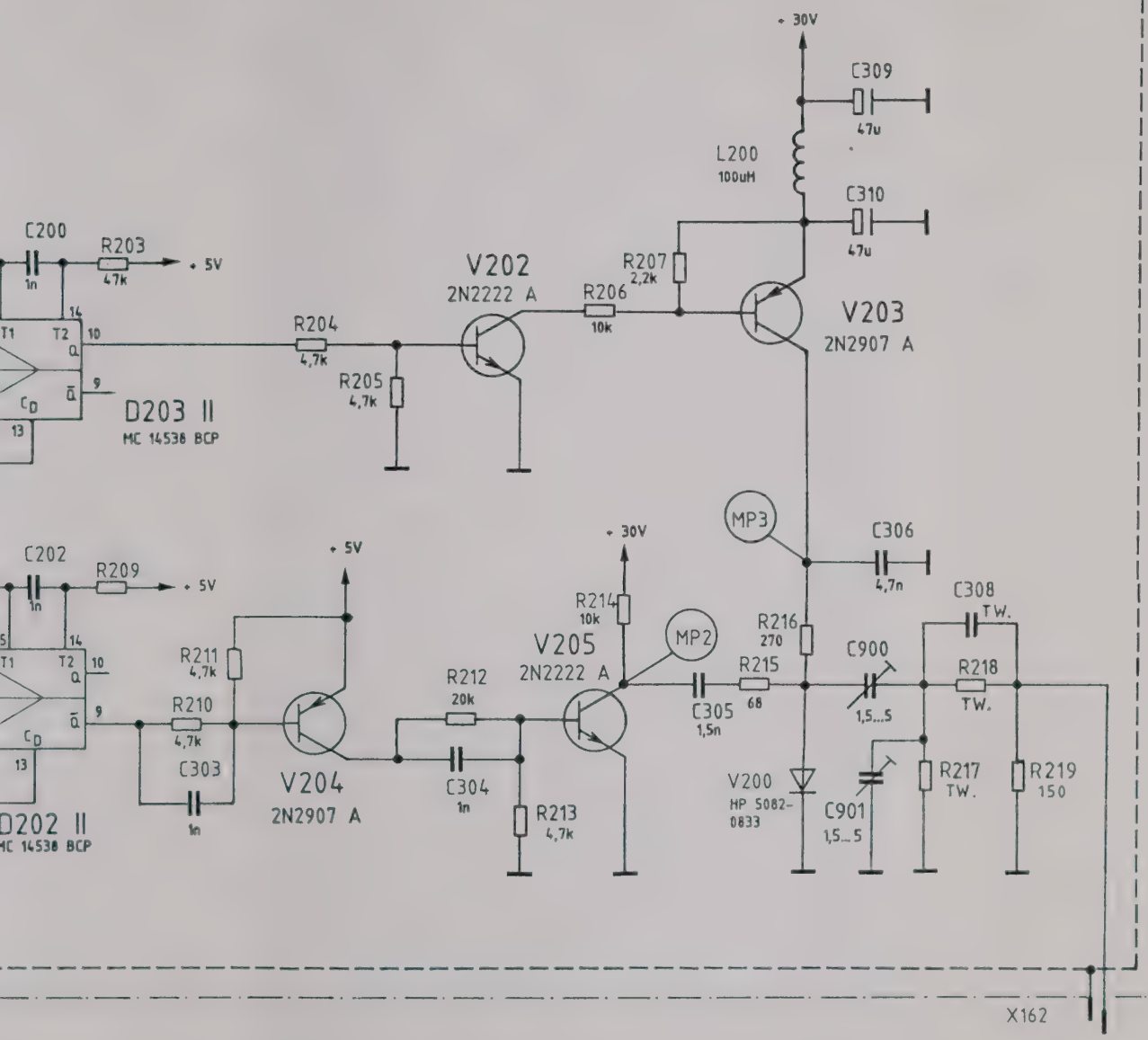


ROHDE & SCHWARZ · MÜNCHEN
unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig

12 81 NI



Stromlauf zu

ESV

Filtersteuerung + Pulsgenerator

Filter Control + Pulse Generator

Z

Zeichn. Nr 342. 5855 S | Bl.1

reg. Nr 342. 4020 V | erste Z 342. 4020

X161

D9/II 4011 &

V72 1N4531

R10 33k + 5V

D12/1

V73 1N4531

D8/II CD 4081 &

R40 33k

D1 CD 4063

D2 CD 4063

D35 CD 4063

D7/I CD 4071 ≥1

D8/I CD 4081 &

D10 CD 4063

D11 CD 4063

R1 R2 R3 R4 4x100k

R5 R6 R7 R8 4x100k

R9 100k

D3 MC 14560 B NBCD-ADDER

D4 MC 14560 B NBCD-ADDER

D5 MC 14561 9's Comp.

D6 MC 14561 9's Comp.

R20 R21 R22 R23 4x100k

R24 R25 R26 R27 4x100k

R28 100k

Erklärung/Explanation

Matrixdiode

V1 V3 V10 V12 V9 V11 V13

V14 V18 V20 V22 V17 V19 V21 V23

V24

V25 V27 V33 V35 V51

V37 V42 V45 V47 V49

V26 V32 V34 V36

V41 V44 V46 V48 V50

1020MHz
930MHz
820MHz
690MHz
520MHz
320MHz
160MHz
80MHz
40MHz
20MHz

LOWER LIMIT

UPPER LIMIT
1300MHz
1020MHz
930MHz
820MHz
690MHz
520MHz
320MHz
160MHz
80MHz
40MHz

Filterbereich / Filter range 10 9 8 7 6 5 4 3 2 1

ROHDE & SCHWARZ

NL 29 783 03 83

10.12 12.81 Bearbeitet Geprüft Normgepr

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locked
a20

b 26 b 25 b 24 b 23 b 22 b 21 b 20 b 19

a16

R32 33k +5V

V70 1N4531

D7/II CD 4071

D8/I CD 4081

Bl. 1 a32 REF.

D12 CD 4029 A
UP/DOWN CK Carry in + 5V
B/D Q1 Q2 Q3 Q4 PE
a14

D13 CD 4028 A
BCD/Dezimal-Dekoder
A B C D

D16 MC 14519
D17 MC 14519
D18 MC 14519
X0 X1 X2 X3 Y0 Y1 Y2 Y3 A B Z0 Z1 Z2 Z3

D19 HEF 4104 P
D20 HEF 4104 P
D21 HEF 4104 P
EO I0 I1 I2 I3 O0 O1 O2 O3

+5V

A B C D

E F G H

D14/II CD 4011
D41/III CD 4011
D14/IV CD 4011
D15 CD 4075

R45 100k +5V

D22 AD 7525 BD
LSB

R46 1,00k
C6 100
V71 HP 2800
C7 100u
R47 1,00k
+ 10V

N23 TL 044 I
N23 TL 044 II

R48 16,2k
R49 14,2k
R900 5k
Gain
R55 2,7k
R53 Bl. 3

R51 1,8M
R52 8,66k
C8 1n
R901 100k
- 10V OFFSET + 10V

C4 100u
C5 10n

D7/IV CD 4071

R50 100k
V168 1N4531
V69 1N4531

10 9 8 7 6 5 4 3 2 1

X161
a 25 a9 a 10 a 11 a 12 a 13 a 21 a 22 a 23 a 24 a,b 6

a15
Oberes Bereichsende

Stromlauf zu Filtersteuerung + Pulsgenerator
Filter Control + Pulse Generator

Zeichn.-Nr 342 5855 S

Blatt- 2

10.12.81 12.81 NL
F 29 783 03.83 NL

	14.12.81	Gr	B	29 285	12.82	NL
earbeitet	12.81	Nl	C	29 783	03.83	NL

ROHDE & SCHWARZ

N23/7
Bl.2

R53
24,9k

N23
TL 044
III

R56
2,7k

V60
1N4531

X161

Shift 2
Shift 1

D26
4016

D25
4016

D24
4016

D38
HEF 4104 P

D39
HEF 4104 P

D40
HEF 4104 P

Bereich 10 Range
Bereich 9 Range
Bereich 8 Range
Bereich 7 Range
Bereich 6 Range
Bereich 5 Range
Bereich 4 Range
Bereich 3 Range
Bereich 2 Range
Bereich 1 Range

+5V
10V

D58
R59

V55 1N4531
V56 1N4531
V57 1N4531
V58 1N4531
V59 1N4531

R33
100k

R34
33k

113k	R60	V = 4,5 Bereich 1 Range
56,2k	R61	V = 2,25 Bereich 2 Range
28k	R62	V = 1,125 Bereich 3 Range
140k	R63	V = 5,625 Bereich 4 Range
59,0k	R64	V = 2,81 Bereich 5 Range
68,1k	R65	V = 4,24 Bereich 6 Range
68,1k	R34	V = 5,76 Bereich 7 Range
68,1k	R35	V = 6,24 Bereich 8 Range
68,1k	R36	V = 6,63 Bereich 9 Range
	R37	V = Bereich 10 Range

32,4k	R66
45,3k	R67
226k	R68
30,1k	R69
32,4k	R70
21k	R85
14,3k	R86
13k	R87
12,1k	R88
	R89

*

D8 IV
4081

a19
< 520MHz

X161

X1
X3

Tuning Voltage

b1 a1 a/b2 b4 a4 — a5 a8

X4 X14 — + 5V — - 10V — + 10V

R90 49,9k — R91 49,9k — R92 49,9k — R93 49,9k

V75 1N4531 — V76 1N4531 — R96 10k — R99 10

N31 I TL 044 — N31 II TL 044 — R94 49,9k — MP 1/3

R130 11,5k — N30 III TL 044 — R131 510k — R132 10k — C9 22u

V92 2N2905A — R133 300k — R134 47,5k — R101 22k — MP 1/8

Pulsgenerator Pulse generator — L200 C309/+ R214

R103 49,9k — R105 49,9k — R106 49,9k — R107 49,9k

V77 1N4531 — V78 1N4531 — R110 10k — R113 10

N31 III TL 044 — N31 IV TL 044 — R108 49,9k — MP 1/4

R109 18,2k — R104 49,9k — R135 300k — R136 7,5k — R138 2,00k

- 10V — R140 4,12k — R142 5,90k — R143 49,9k — R145 49,9k

R149 18,2k — R144 49,9k — N32 III TL 044 — V81 1N4531 — V82 1N4531

R146 49,9k — R147 49,9k — R150 4,32 — R153 10 — R152 5,90k

N32 IV TL 044 — R148 49,9k — MP 1/6

R117 49,9k — R119 49,9k — R120 49,9k — R121 49,9k

V79 1N4531 — V80 1N4531 — R124 4,87k — R126 5,23k — R127 10

N32 I TL 044 — N32 II TL 044 — R122 49,9k — MP 1/5

R123 18,2k — R118 49,9k

- 10V — R154 3,16k — R156 6,81k — R157 49,9k — R159 49,9k

R163 18,2k — R158 49,9k — N33 I TL 044 — V83 1N4531 — V84 1N4531

R160 49,9k — R161 49,9k — R162 49,9k — R164 3,09k — R166 6,81k

R165 10 — N33 II TL 044 — MP 1/7

D1 - D4, D10 - D13, D16 - D21, D25, D36, D40 D38, D39, D200 -D203 N23, N30 - N33

Draufsicht Top view

D5 - D9, D14, D15, D24, D25, D26

Draufsicht Top view

Diode und Widerstand nur einmal für alle HEF 4104 P
Only one diode and resistor for all HEF's 4104 P.

+ 10V — V85 ZPD 5,1V — R170 10 k — V_{DD0} V_{DD1} D19 - D21, D38, D39 D40

+ 5V — C20 - C24 — D1-D4, D10-D13, D16-D18, D35, D36 D200-D203

V_{DD} + 5V — D5-D9, D14, D15, D24, D25, D26

+ 10V — N23, N30-N33 — - 10V

VAR 02 = Grundvariante
Basic model

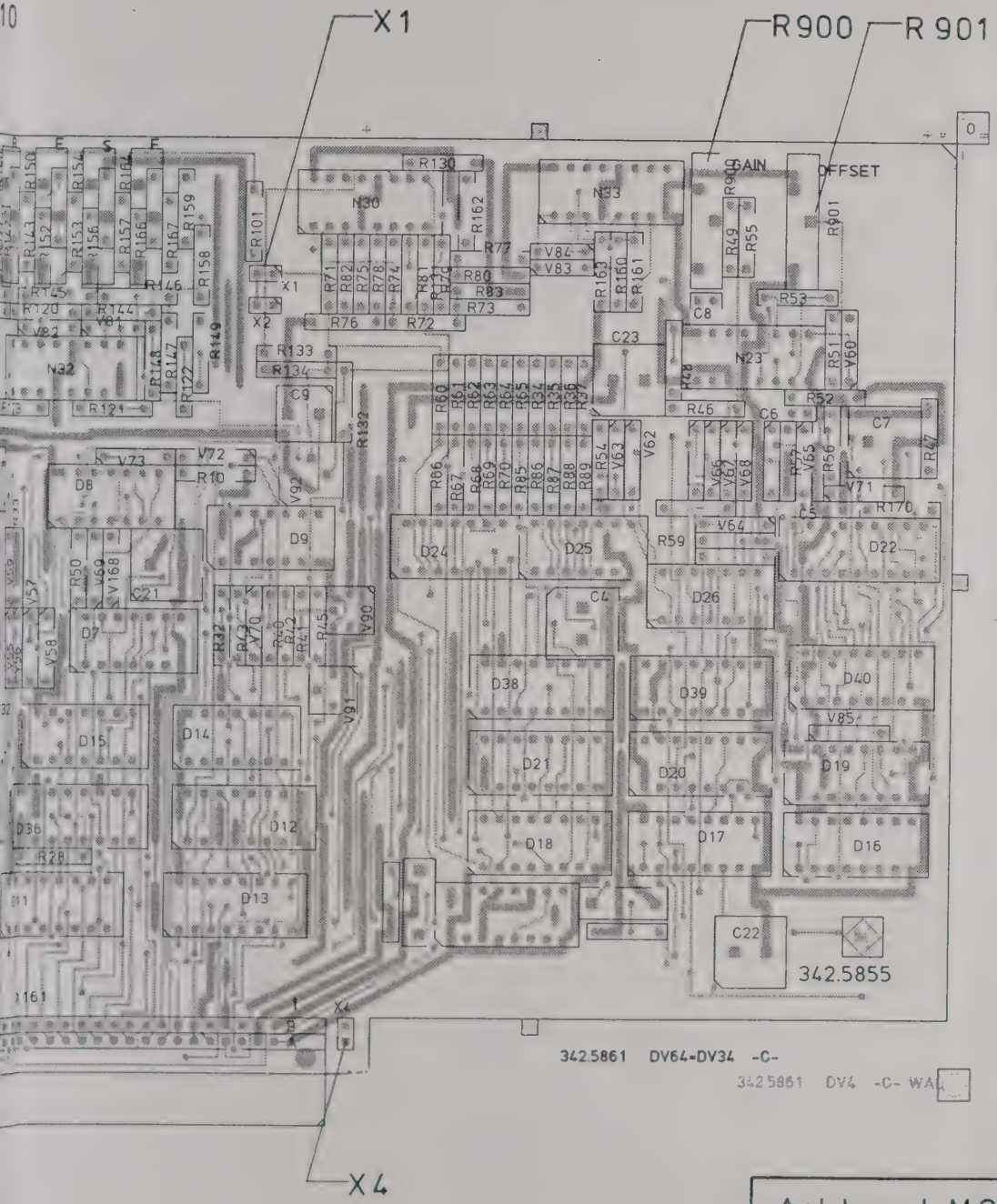
Stromlauf zu: Filtersteuerung + Pulsgenerator
Filter Control + Pulse Generator

Zeichn.-Nr: 342. 5855 S

Blatt-Nr: 3

ks on component side

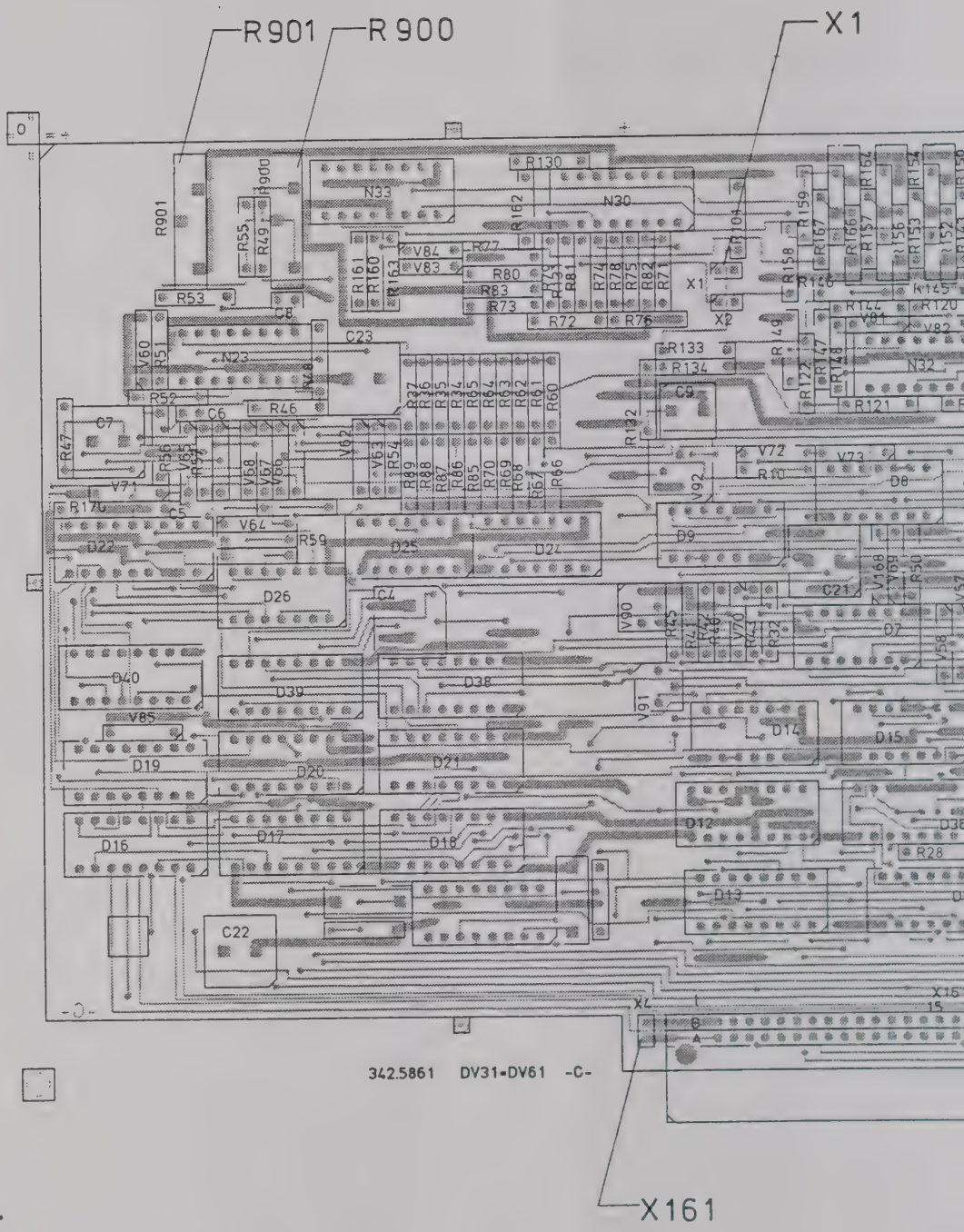
10



Achtung! MOS-Bauteile
Caution. MOS components

C	28717	7 82	NL	Maße ohne Toleranzangabe	Maßstab 1 : 1
F	29 783	03.83	NL		Halbzeug, Werkstoff
				1GM Tag Name	Benennung
				Bearb 7 82 NL	Filtersteuerung + Pulsgenerator Filter Control + Pulse Generator
				Prüf	
				Norm	
				ROHDE & SCHWARZ	342 5855

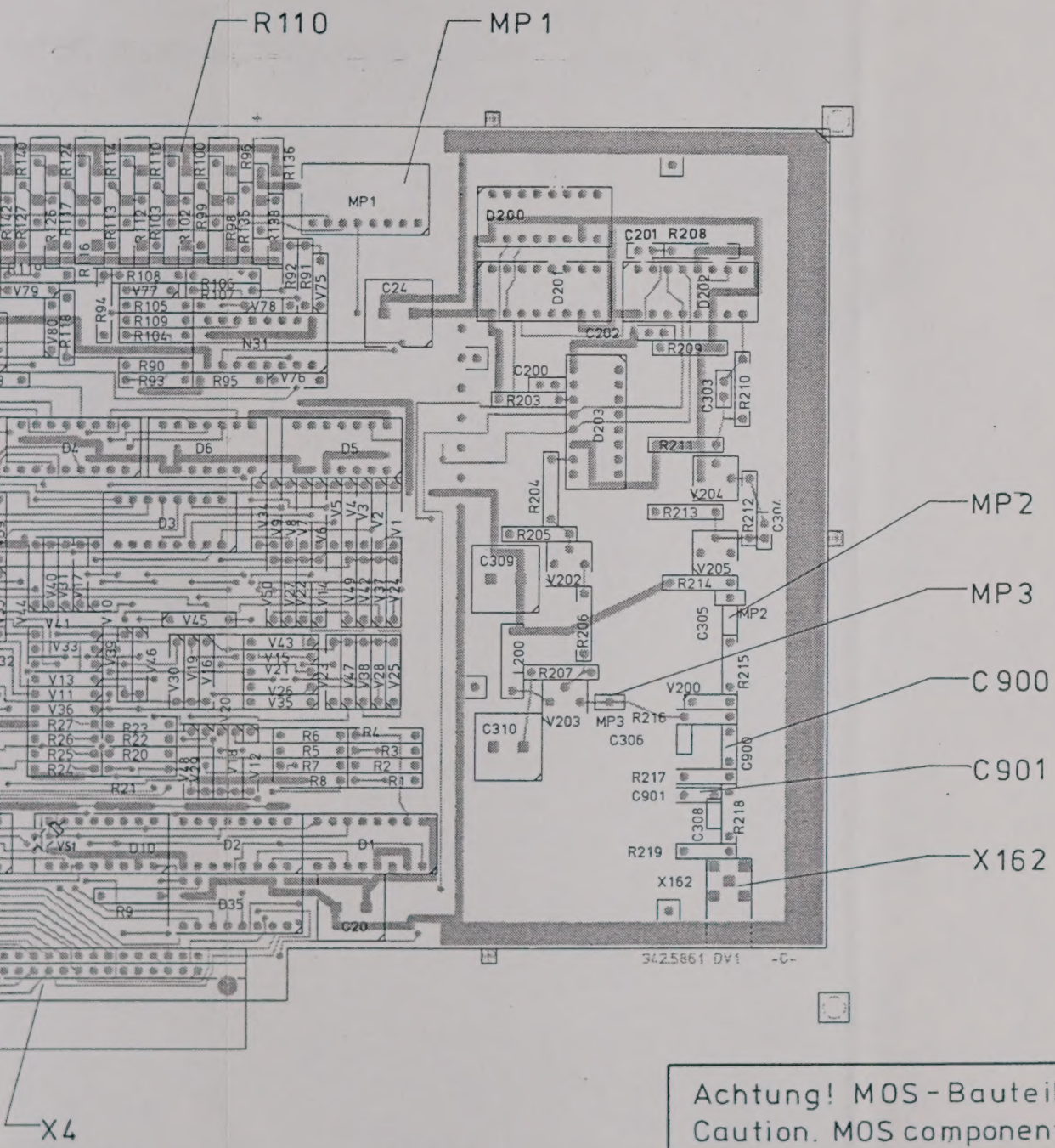
Ansicht und Leitu
View of tracks on



Symbolschlüssel

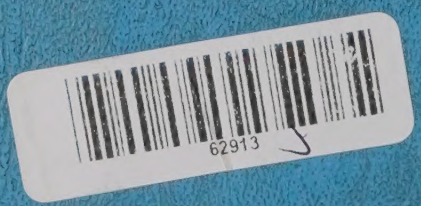
wir uns alle Rechte vor.

solder side



Achtung! MOS-Bauteile
Caution. MOS components

C	28717	7.82	NL	Maße ohne Toleranzangabe		Maßstab 1:1	
F	29 783	03.83	NL			Halbzeug, Werkstoff	
				1GM	Tag	Name	Benennung
				Bearb	7.82	NL	Filtersteuerung + Pulsgenerator Filter Control + Pulse Generator
				Gepr.			Z
				Norm			
				ROHDE&SCHWARZ		Zeichn.-Nr 342.5855	Blatt-Nr 3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